The Race for Waste

The Evolution and Implementation of India's Municipal Solid Waste Management Agenda over the past Three Decades until 2016

The Example of Delhi's Municipal Solid Waste Management Economy

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Abstract

The continually increasing generation of waste and its management pose one of the biggest challenges for cities across the world. This is especially true for emerging and fast-growing economies like India that are facing dynamic transformations which are characterised by a growing population, rising (average) incomes, increasing urbanisation levels, and a growing middle class. The growing generation of municipal solid waste (MSW) and the management thereof are an increased challenge particularly for urban authorities, as is the case in Delhi, since the lack of financial means, skills and knowledge leads to a severely constrained infrastructure and limited capacities of the municipalities involved.

Traditionally, MSW management provides income opportunities for the urban poor working in informality. Waste workers in the informal economy provide essential services to the city of Delhi as they form the very base of waste collection, segregation and dismantling. However, over many years, developments in the institutionalised framework have increased the competition for access to waste between the informal and formal economies in the city. This has laid the ground for a conflicted relationship between formal private sector actors and the public sector on the one hand and informal private actors on the other.

The two central objectives of this PhD research are, first, to analyse Indian municipal solid waste management policies, programmes and guidelines that were published over the past three decades, and, second, to analyse Delhi's MSWM stakeholders to identify underlying actors' dynamics, and who and what drives, shapes or prevents change in the context of MSWM. At the centre of the overarching argument lies the assumption that the developments of India's MSWM over the last thirty years, which are driven by an investment-heavy and technology-based approach, reveal major gaps between policy and implementation, whose environmental and societal negative impacts of which are very much visible in India's capital. One focus of this research is on the role and status of waste workers and the area of tension between informal waste workers, on the one hand, and formal sector representatives and Delhi's authorities, on the other.

The research attempts to move between two poles: At one end, waste—as something excessive and expandable—is a management challenge for Delhi's municipalities; at the other end, waste—as something productive and profitable—is an economic opportunity for the urban poor of the informal economy as well as for formal private sector actors.

Zusammenfassung

Die stetig wachsende Abfallerzeugung und -bewirtschaftung stellt Städte auf der ganzen Welt vor große Herausforderungen. Dies gilt insbesondere für Städte in aufstrebenden und schnell wachsenden Volkswirtschaften wie Indien, die sich dynamischen Transformationen gegenübersehen, welche durch eine wachsende Bevölkerung, steigende (durchschnittliche) Einkommen und eine zunehmende Verstädterung gekennzeichnet sind. Das wachsende Aufkommen von Siedlungsabfällen und das Management derselben stellen insbesondere für städtische Behörden eine erhöhte Herausforderung dar. Dies ist auch in Delhi der Fall, da der Mangel an finanziellen Mitteln und technischem Wissen zu einer stark eingeschränkten Infrastruktur und begrenzten Kapazitäten in den betroffenen Gemeinden führt.

Das Siedlungsabfallmanagement bietet traditionell Einkommensmöglichkeiten für Stadtbewohner, die informell arbeiten. Informelle Abfallarbeiter erbringen, durch Sammeln, Trennen und Zerlegen von Abfällen, wesentliche Dienstleistungen für die Stadt Delhi. Über viele Jahre hinweg haben die Entwicklungen im institutionalisierten Rahmen den Wettbewerb zwischen den informellen und formellen Abfallwirtschaftsakteuren um den Zugang zu Siedlungsabfällen verschärft. Dies hat die Grundlage für das Konfliktverhältnis zwischen den formellen Akteuren des Privatsektors und dem öffentlichen Sektor einerseits sowie den informellen Akteuren andererseits geschaffen.

Das zentrale Ziel dieser Doktorarbeit ist es, zum einen die in den letzten drei Jahrzehnten veröffentlichten Strategien, Programme und Richtlinien für die Abfallbewirtschaftung in Indien und zum anderen die Akteure der Siedlungsabfallwirtschaft in Delhi zu analysieren. Auf diese Weise soll herausgearbeitet werden, welche Akteure oder Elemente Veränderungen im Kontext der Siedlungsabfallwirtschaft antreiben oder verhindern. Zentrale Annahme der Dissertation ist, dass die Entwicklungen in der Siedlungsabfallbewirtschaftung Indiens, die maßgeblich von einem investitionsintensiven und technologiebasierten Ansatz angetrieben werden, erhebliche Lücken zwischen Politik und Umsetzung aufzeigen, deren negative ökologische und gesellschaftliche Auswirkungen in der Hauptstadt sehr deutlich spürbar sind. Zwei Forschungsschwerpunkte liegen hierbei auf der Rolle der informellen Abfallarbeiter und auf dem Spannungsfeld zwischen informellen, formellen und behördlichen Akteuren in Delhi. Die Analyse findet vor dem Hintergrund statt, dass der im Übermaß vorhandene Abfall sowohl eine Managementherausforderung für die Kommunen in Delhi, als auch eine wirtschaftliche Chance für die städtischen Armen sowie für Akteure des Privatsektors darstellt.

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Abbreviations

AAP	Aam Aadmi Party
ADB	Asian Development Bank
AIKMM	All India Kabadi Mazdoor Mahasangh (All India Ragpickers Union)
AIW	Alliance of Indian Wastepickers
ASSOCHAM	Associated Chambers of Commerce and Industry of India
BIS	Bureau of Indian Standards
BJP	Bharatiya Janata Party
BSUP	Basic Services to Urban Poor
C&D	Construction and Demolition
C&I	Commercial and Industrial
CAG	Comptroller and Auditor General of India
CE	Circular Economy
CII	Confederation of Indian Industries
CPCB	Central Pollution Control Board
CPHEEO	Central Public Health and Environmental Engineering Organisation
CSE	Centre for Science and Environment
DDA	Delhi Development Authority
DCB	Delhi Cantonment Board
DEA	Department of Economic Affairs
DTDC	Door-to-door collection
EC	European Commission
EDMC	East Delhi Municipal Corporation
EPA	Environment Protection Act
EPR	Extended Producer Responsibility
EU	European Union
FICCI	Federation of Indian Chambers of Commerce & Industry
GDP	Gross Domestic Product
GHG	Green House Gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
GNI	Gross National Income
GoI	Government of India
HHW	Household Hazardous Waste

HLRN	Housing and Land Rights Network
ICI	Industrial, Commercial and Institutional
IFI	International Finance Institution
IHPH	Institute of Hygiene and Public Health
IL&FS	Infrastructure Leasing & Financial Services
ILO	International Labour Organization
INDCs	Intended Nationally Determined Contributions
IPCC	Intergovernmental Panel on Climate Change
ISWA	International Solid Waste Association
ISWM	Integrated Sustainable Waste Management
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
MCD	Municipal Corporation of Delhi
MNES	Ministry of Non-conventional Energy Sources
MoA	Ministry of Agriculture
MoEF	Ministry of Environment and Forests
MoEFCC	Ministry of Environment, Forest and Climate Change
MoF	Ministry of Finance
MoHUA	Ministry of Housing and Urban Affairs
MoRD	Ministry of Rural Development
MoUAE	Ministry of Urban Affairs and Employment
MoUD	Ministry of Urban Development
MRF	Material Recovery Facility
MSW	Municipal Solid Waste
MSWM	Municipal Solid Waste Management
MT	Metric Tonnes
MTS	Mobile Transfer Station
NAPCC	National Action Plan on Climate Change
NCT	National Capital Territory
NDMC	New Delhi Municipal Council
NEERI	National Environmental Engineering Research Institute
NEP	National Environment Policy
NGO	Non-governmental Organisation
NIMBY	Not In My Backyard
NITI	National Institution for Transforming India

NIUA	National Institute of Urban Affairs
NSDP	National Slum Development Programme
NWMC	National Waste Management Council
OECD	Organisation for Economic Co-operation and Development
PAYT	Pay-As-You-Throw
PCC	Pollution Control Committee
PIL	Public Interest Litigation
PPP	Public-Private Partnership
R&D	Research and Development
RDD	Rural Development Department
RDF	Refuse Derived Fuel
RE	Resource Efficiency
RWA	Residence Welfare Association
SBM	Swachh Bharat Mission (Clean India Mission)
SDMC	South Delhi Municipal Corporation
SPCB	State Pollution Control Board
SWM	Solid Waste Management
TERI	The Energy and Resources Institute
TL	Toxics Link
TPD	Tonnes Per Day
TPY	Tonnes Per Year
UDD	Urban Development Department
ULB	Urban Local Body
UNCED	United Nations Conference on Environment and Development
UNCSD	United Nations Conference on Sustainable Development
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UN-Habitat	United Nations Human Settlements Programme
US	United States
USD	United States Dollar
WB	World Bank
WSSD	World Summit on Sustainable Development
WtE	Waste-to-Energy
WW	Waste Worker

1. Introduction

The continually increasing generation of waste and its management pose one of the biggest challenges for cities across the world. This is especially true for emerging and fast-growing economies like India that are facing dynamic transformations which are characterised by a growing population, rising (average) incomes, increasing urbanisation levels, and a growing middle class. The growing generation of municipal solid waste (MSW)[1] and the management thereof are an increased challenge particularly for urban authorities, as is the case in Delhi, since the lack of financial means, skills and knowledge leads to a severely constrained infrastructure and limited capacities of the municipalities involved.

Traditionally, MSW management provides income opportunities for the urban poor working in informality[2]. Waste workers[3] in the informal economy provide essential services to the city of Delhi as they form the very base of waste collection, segregation and dismantling; Delhi's official waste management system would not be able to manage the generated waste without them. Nevertheless, the government does not duly recognise the effectiveness of waste workers, as most of the state-led interventions in the solid waste management (SWM) system run parallel to the work of the informal waste economy. These increase the competition for access to waste between the informal and the formal economy, and therefore pose a threat to the livelihood of waste workers.

Effective solid waste management is a complex challenge and its successful implementation heavily depends on the effectiveness of an equally complex actor landscape. The actor landscape of Delhi's municipal solid waste management (MSWM) economy is as diverse as it is dynamic, and is shaped by various public, private and community level actors and the interactions, alliances and conflicts among those actors. The complexity of the landscape is increased by the diverse actors' objectives and priorities, various technologies, and manifold

[1] The definition of MSW varies between countries. For an outline about which definition this research is based on, see Chapter 2.

[2] The understanding of 'informality' has been broadened since it was first defined by British anthropologist Keith Hart and the International Labour Organization (ILO) in the early 1970s. In the beginning of the debate, the focus was on the characteristics of informal activities, namely the activities themselves as well as prerequisites and structure(s). The focus then shifted to the status of labour and the consequences for informal workers concerning their lack of social security and unprotected working conditions. In 2002, the ILO shifted from the term 'informal sector' to the term 'informal economy', which is defined as "(…) all economic activities by workers and economic units that are—in law or in practice—not covered or insufficiently covered by formal arrangements. These activities are not included in the law, which means that they are operating outside the formal reach of the law; or they are not covered in practice, which means that—although they are operating within the formal reach of the law, the law is not applied or enforced; or the law discourages compliance because it is inappropriate, burdensome, or imposes excessive costs" (International Labour Organization, 2002: 53). For more details on 'informality' see Chapter 5.1.2.

[3] The term waste worker is used to refer to anyone earning their livelihood in the informal waste economy.

and divergent management approaches of the various actors. The case of Delhi is especially challenging as the city has been at the forefront of a policy shift towards privatisation and its actor landscape therefore mirrors the developments of the recent years. Urban local bodies (ULBs), citizen groups, civil society and the private sector (formal and informal) are all involved in developing and driving a variety of approaches to find sustainable working solutions for Delhi's solid waste management challenge.

Over many years, developments in the institutionalised framework have increased the competition for access to waste between the informal and formal economies in the city. This has laid the ground for a conflicted relationship between formal private sector actors and the public sector on the one hand, and informal private actors on the other. The potential social, environmental and economic gains for involved actors that would result from synergies and collaborations, also between the informal and the formal waste economies, have either been undermined or not taken into consideration by the national and local government so far. In 2016, the Government of India (GoI) published the revised Solid Waste Management Rules, 2016. These rules—as compared to the initial Municipal Solid Wastes (Management and Handling) Rules, 2000—included more details on almost every waste management stage, be it segregation at source, transportation of waste, or treatment or final disposal. At the same time the functions of relevant stakeholders are outlined in more detail and the contribution of informal waste workers has been recognised. The new rules might be the first step in the direction of a more inclusive approach and indicate the understanding of the government—that informal waste workers play a crucial role in the waste management economy.

1.1. The Ever-Growing 'Wasteline'

While rising quantities of waste are certainly a global challenge, the waste challenge manifests itself mostly in urban areas around the world, even more so in countries of the Global South. Unplanned urbanisation combined with a high population density and large numbers of urban poor lead to a challenging waste management situation for local governments, as the cities' infrastructures are weak and the capacities of the municipalities are severely constrained due to the lack of financial means, skills and knowledge.[4] Moreover due to higher than average per capita incomes (compared to the national average), waste becomes one of the most important by-products of an urban lifestyle as urban settlements in low- and middle-

[4] UN-Habitat, *Solid Waste Management in the World's Cities*, Third edition ed. (Earthscan 2010); Ministry of Finance, *Position Paper on the Solid Waste Management Sector in India* (New Delhi: Government of India, 2009).

income countries[5] continue to transform into major centres of consumption and hence major waste generators. As is the common practice in most countries across the world, the dominant model still is a linear make-use-throw production process, which adds to the generation of waste and leads to a situation in which "[g]lobally, waste volumes are increasing […] even faster than the rate of urbanization."[6] In addition, changing consumption patterns influence the composition of waste streams with newer product categories becoming part of the waste management challenge.

Among the different fractions of solid waste[7], such as hazardous waste,[8] municipal solid waste, electronic waste (e-waste), bio-medical waste,[9] construction and demolition waste (C&D)[10] and industrial waste,[11] major importance has been attached to MSW. One reason for this is the amount of MSW which is being generated per year: MSW covers almost half of the waste generated globally.[12] As depicted in Graph 1, India's solid waste composition in

[5] The term 'low- and middle-income country' was coined by the World Bank. In its 2016 edition of the World Development Indicators, the World Bank differentiates between four country groups, based on their respective Gross National Income (GNI) per capita. The four categories are reflected in US dollars and reset each year. In 2016, India fell in the lower middle-income category, with a GNI per capita of 1,680 US dollars. The World Bank, "World Development Indicators", The World Bank, http://datatopics.worldbank.org/world-development-indicators/ (last accessed April 8, 2019).

[6] Daniel Hoornweg and Perinaz Bhada-Tata, *What a Waste: A Global Review of Solid Waste Management*, ed. The World Bank (Washington DC: The World Bank, 2012), X.

[7] It is important to mention that the understanding of waste typologies differs between countries, regions, institutions and organisations. Thus, when going into detail, the European Commission (EC) considers a different set of waste streams and/or different waste stream compositions compared to the World Bank (WB), the United Nations Human Settlements Programme (UN-Habitat) or the Organisation for Economic Co-operation and Development (OECD) for instance. The same becomes evident when looking into the policy agendas and frameworks of different countries. In the present research, the understanding of waste typologies formulated in the Indian policy context is being applied. European Commission, *Detailed Assessment of Waste Management Plans. First Batch* (European Commission, 2016) 8; UN-Habitat, *Solid Waste Management in the World's Cities*, 7; Hoornweg and Bhada-Tata, *What a Waste: A Global Review of Solid Waste Management*, 7; UN-Habitat, *Collection of Municipal Solid Waste in Developing Countries* (UN-Habitat, 2010).

[8] " '[H]azardous waste' means any waste which by reason of characteristics such as physical, chemical, biological, reactive, toxic, flammable, explosive or corrosive, causes danger or is likely to cause danger to health or environment (…)." Ministry of Environment, Forest and Climate Change, "Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016", (New Delhi: Government of India, 2016), 3.

[9] Until 1998, when the MoEF notified the Bio-medical Waste (Management & Handling) Rules, 1998, this waste stream was considered to be part of the MSW. " '[B]io-medical waste' means any waste, which is generated during the diagnosis, treatment or immunisation of human beings or animals or research activities pertaining thereto or in the production or testing of biological or in health camps" Ministry of Environment,Forest and Climate Change Ministry of Environment, "Bio-Medical Waste Management Rules, 2016", (New Delhi: Government of India, 2016), 3.

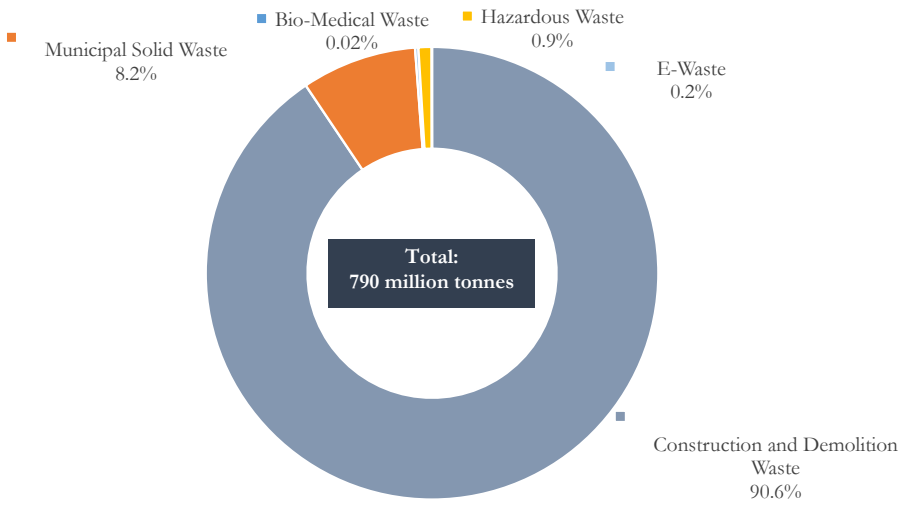
[10] " '[C]onstruction and demolition waste' means the waste comprising of building materials, debris and rubble resulting from construction, re-modeling, repair and demolition of any civil structure." Ministry of Environment,Forest and Climate Change Ministry of Environment, "Construction and Demolition Waste Management Rules, 2016", (New Delhi: Government of India, 2016), 2.

[11] Industrial waste can be classified into two types: hazardous industrial waste and non-hazardous industrial waste. Hazardous industrial waste can be in solid, liquid or gaseous form. Non-hazardous industrial waste is similar to household waste by its nature and in composition. Since it is not toxic, it does not need special treatment. While a variety of Indian agencies have defined hazardous waste, there is no unified definition for industrial waste in place.

[12] Alexandra Le Courtois, "Municipal Solid Waste: Turning a Problem into Resource", *Private Sector & Development*, no. 15 (2012): 2.

the year 2015–2016 is dominated by C&D waste amounting to 90 per cent of solid waste generated as a whole.[13] The MSW stream ranks second with 65 million tonnes of waste generated in 2015–2016. Waste streams of hazardous waste, e-waste and bio-medical waste amounted to less than 1 per cent of the overall amount of solid waste generated in India in the same period. In regard to the figures mentioned and especially in regard to the e-waste stream being one of the fastest growing waste streams in the world[14], one needs to keep in mind the existing lacuna of a system to periodically collect and update the countrywide data base on the waste quantities and composition.

Graph 1: India's solid waste generation in million tonnes and its percentage composition between 2015–2016



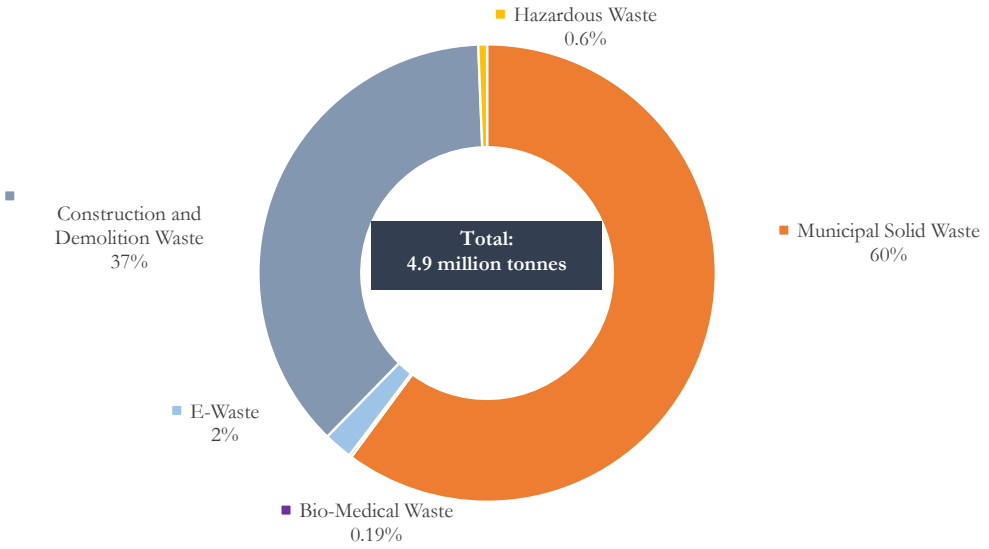
Sources: Data from ASSOCHAM (2018); GIZ (2015); MoEFCC, "Environment Ministry notifies Hazardous Waste Management Rules, 2016" (2016).

Delhi's composition of annually generated solid waste between 2015 and 2016, as depicted in Graph 2, underlines the scope of the MSW challenge Delhi is facing: with a share of 60 per cent of the overall solid waste being generated in Delhi, MSW is the most significant waste fraction in terms of quantity.

[13] It is important to note here that until 2016, C&D waste was, by default, the responsibility of the respective municipality. With no specified C&D rule in place, the C&D waste generated in the realms of a city ended up in the MSW waste stream. However, realising the management and treatment challenge connected to the annual estimate of 716 million tonnes of C&D waste, in 2016 the Ministry of Environment, Forest and Climate Change (MoEFCC) published Construction and Demolition Waste Management Rules, 2016.

[14] Ashish Chaturvedi, Rachna Arora, and Ulrike Kilguss, "E-Waste Recycling in India–Bridging the Formal–Informal Divide", *Environmental Scenario in India: Successes and Predicaments, London: Routledge* (2011).

Graph 2: Delhi's solid waste generation in million tonnes and its percentage composition between 2015–2016



Sources: Data from ASSOCHAM (2018); Government of Delhi (2015); IL&FS (2016).

According to the World Bank, global generation of urban solid waste will rise by almost 70 per cent between 2012 and 2025 and again, these challenges are especially acute in countries of the Global South. While India continues its pace of urbanisation and development, solid waste quantities are projected to increase considerably. It is estimated that due to expanding urban populations and increasing incomes per capita, urban waste generation in the South Asian region (including India) will rise by more than 194 per cent by 2025.[15] While all other solid waste categories mentioned have, if not managed sustainably, their own specific impacts on the environment, inhabitants and development of a city or a country, this research focusses on MSW, as the growing amounts of municipal solid waste, propelled by factors such as urbanisation, changing lifestyles and consumption patterns, recall the urgent need to rethink urban MSW management strategies: the sheer amount of India's MSW, and Delhi's MSW in particular, underlines the topicality of the research at hand. With India and Delhi being the world's second most populous country and city, respectively,[16] this topic becomes even more urgent. India's urban population will nearly double by 2050, leading to a situation in which almost half of the country's population will be urban dwellers,[17] and hence potential waste generators. The pressing need for India to develop and establish an MSWM system that serves the country's needs and matches its ecology, social conditions and economy is

[15] Hoornweg and Bhada-Tata, *What a Waste: A Global Review of Solid Waste Management*, 8–10.
[16] United Nations, *World Urbanization Prospects: The 2014 Revision* (United Nations, 2015), 91.
[17] Ibid., 56, 90–93, 198.

therefore continuously increasing, especially with Delhi—a capital that continues to draw public, political and media attention due to its insufficiently functioning MSWM system—as its spearhead.[18]

The research considers a timeframe of thirty years, starting in 1986, which marks the year in which the GoI enacted the Environment (Protection) Act, 1986 (EPA), which serves as an umbrella legislation for the protection and improvement of the Indian environment. The EPA also builds the umbrella for all subsequent policies related to municipal solid waste in India.[19] While the period analysed closes in 2016, the year the revisited Solid Waste Management Rules, 2016 were published, the present research attempts to consider the developments until 2018 in the outlook.

1.2. Objective and Thesis

The two central objectives of this PhD research are, first, to analyse Indian municipal solid waste management policies, programmes and guidelines that were published over the past three decades, and, second, to analyse Delhi's MSWM stakeholders, their alliances and coalitions. It then contrasts the derived insights and eventually identifies underlying actors' dynamics, and who and what drives, prevents or shapes change in the context of MSWM. Looking at the example of Delhi, this research aims to create a better understanding of the power relations and political processes behind decision making, and about drivers of change in solid waste management over the past thirty years. To reach to a better understanding, it

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[18] Avikal Somvanshi, "The Economy and Politics of Solid Waste in Delhi. A Rotten Deal for Ragpickers", *Down to Earth*, September 15, 2010 (last accessed April 11, 2019); Kundan Pandey, "Okhla Waste-to-Energy Plant Will Be Closed, Assures Arvind Kejriwal", ibid., July 4, 2015, https://www.downtoearth.org.in/news/okhla-wastetoenergy-plant-will-be-closed-assures-arvind-kejriwal-48746 (last accessed April 10, 2019); Soma Basu, "Okhla Waste to Energy Plant Put on Notice for Excess Emissions", ibid., https://www.downtoearth.org.in/news/okhla-waste-to-energy-plant-put-on-notice-for-excess-emissions-43236 (last accessed April 9, 2019); Debobrat Ghose, "Waste Management Is Imperative in Delhi as the National Capital Inches Closer to Another Deonar", *Firstpost*, March 28, 2016, https://www.firstpost.com/india/waste-management-is-imperative-in-delhi-as-the-national-capital-inches-closer-to-another-deonar-2697564.html (last accessed April 10, 2019); Apula Singh, "No More N-I-M-B-Y", *Down to Earth*, September 9, 2016, https://www.downtoearth.org.in/blog/waste/no-more-n-i-m-b-y-55596 (last accessed April 10, 2019); "'MCD Trifurcation Will Benefit Delhi'", *The Hindu*, March 5, 2012, http://www.thehindu.com/todays-paper/tp-national/tp-newdelhi/mcd-trifurcation-will-benefit-delhi/article2962005.ece (last accessed April 9, 2019); "What Is Total Quantity of Waste Generated by Delhi, Asks NGT", *The Economic Times*, November 16, 2016, https://economictimes.indiatimes.com/news/politics-and-nation/what-is-total-quantity-of-waste-generated-by-delhi-asks-ngt/articleshow/55548059.cms (last accessed April 9, 2019); "South Delhi Drowns in Trash as Waste Management Agency Pays No Heed", *India Today*, October 1, 2014, https://www.indiatoday.in/india/north/story/south-delhi-drowns-in-its-own-trash-as-waste-management-agency-pays-no-heed-208176-2014-10-01 (last accessed November 13, 2017); Chetan Chauhan, "India Deserves Nobel for Dirt, Filth: Jairam", *Hindustan Times*, November 21, 2009, https://www.hindustantimes.com/india/india-deserves-nobel-for-dirt-filth-jairam/story-GutpvwmEapoP5S6DCiZ1CP.html (last accessed April 9, 2019).

[19] Rachna Arora, Katharina Paterok, Abhijit Banerjee et al., "Potential and Relevance of Urban Mining in the Context of Sustainable Cities", *IIMB Management Review* (2017).

is essential to look at the development and constellations of Delhi's actor landscape during the past decades and to identify turning points and crises in India's municipal solid waste management agenda.

At the centre of the overarching argument lies the assumption that the developments of India's MSWM over the last thirty years, which are driven by an investment-heavy and technology-based approach, reveal major gaps between policy and implementation, whose environmental and societal negative impacts of which are very much visible in India's capital. In the last thirty years, the actors' landscape in Delhi's solid waste management economy has evolved, new alliances have been formed, while the actors of the informal economy still remain unrecognised despite their fundamental relevance for the city of Delhi. These developments are initiated and further manifested by the agenda setting of the government and the formal private sector, which can be characterised either by the rigidity of a system in which the informal waste workers systemically cannot be integrated into the institutionalised frame, or by the interest-driven approach which has been applied, despite the undeniably huge informal waste workforce on which all involved actors are highly dependent. A combination of lack of understanding of waste flows and quantities, lack of acknowledgement of the informal waste workers, lack of accountability and failure of political participatory decision-making processes, creates the need for a better understanding of exactly these dynamics and power relations between the involved stakeholders. One focus of this research is on the role and status of waste workers and the area of tension between informal waste workers, on the one hand, and formal sector representatives and Delhi's authorities, on the other.

The research attempts to move between two poles: at one end, waste—as something excessive and expandable—is a management challenge for Delhi's municipalities; at the other end, waste—as something productive and profitable—is an economic opportunity for the urban poor of the informal economy, as well as for formal private sector actors.[20] As it is, waste "[a]s society's excrement it has become an immanent limit to its wellbeing and reproduction, as well as a vector of realized and potential value".[21]

Box 1: India's waste culture—Cultural and religious implications

The branding and stigmatisation of people who work with waste is a worldwide and historical phenomenon. Although the work with waste has been an income generating activity

[20] Ashish Chaturvedi, Koneru Vijayalakshmi, and Saksham Nijhawan, *Scenarios of Waste and Resource Management: For Cities in India and Elsewhere* (2015); Vinay Gidwani and Rajyashree N Reddy, "The Afterlives of "Waste": Notes from India for a Minor History of Capitalist Surplus", *Antipode* 43, no. 5 (2011); William A Cohen and Ryan Johnson, *Filth: Dirt, Disgust, and Modern Life* (U of Minnesota Press, 2005).

[21] Gidwani and Reddy, "The Afterlives of "Waste": Notes from India for a Minor History of Capitalist Surplus", 1636.

throughout the centuries, there has always been a link between the excluded and stigmatised status of the people working in that sector, and the work with waste itself. This phenomenon and the negative attitude towards people in the waste economy is evident in countries in the Global South as well as in countries in the Global North, but the conditions of the latter have changed during the decades. However, till the middle of the twentieth century, working with waste material in European countries was considered a very low activity. Those who were dependent on this work were marginalised and excluded and led a life as outcastes in society. Till today, the situation for people involved in the waste economy in Asian countries has not changed much.[22]

In India, where almost 80 per cent[23] of the population follows the Hindu religion, the situation for people who are engaged in the waste economy is particularly difficult. The differentiation between purity and impurity constitutes a major aspect in the Hindu ideology. Waste is seen as polluted, and so the stigma attached to this work is difficult for waste workers to shrug off. Hence, the Hindu religion itself can almost be seen as a catalyst of the ongoing negative distinction and labelling of employment within the waste economy. The consequence is that people working in this economy are still seen as outcastes and live a life at the margins of society.

> The people living from waste are always implicated as a parasitic, filthy and criminal element of society and thus most government officials or urban dwellers usually consider them to be a marginal group which they sometimes feel pity for, but mostly treat them with aversion and hostility. (…) [T]hose people working with waste materials are habitually disregarded, disesteemed and per se socially marginalized.[24]

These implications, which are heavily based on cultural and religious aspects and affect informal as well as formal waste workers, are considered throughout this research as underlying circumstances when analysing India's municipal solid waste management economy. The detailed analysis of these cultural implications, however, is limited to a series of "India's waste culture" text boxes and is therefore not a central part of this research, which focusses on dynamics and processes in the political, environmental and social realm.

[22] Ibid., 140-45; Furedy, "Challenges in Reforming the Philosophy and Practice of Solid Waste Management: A Social Perspective".
[23] "Religion Census 2011", https://www.census2011.co.in/religion.php (last accessed April 10, 2019).
[24] Köberlein, *Living from Waste: Livelihoods of the Actors Involved in Delhi's Informal Waste Recycling Economy*, 5+140.

1.3. Relevance and Current State of Research in the Defined Area

The existing literature on MSW, and MSW in India and Delhi, encompasses the continuum between the aforementioned two poles. The literature embedded along the lines of this continuum can be broadly distinguished into three fields, thematically covering environment, economic, and social aspects of waste management.

The literature focussing on the economic aspects of waste management highlights the fact that the solid waste market is not only a public service, but also an economic sector which has a worth of 390 billion USD in economies of the Organisation for Economic Co-operation and Development (OECD) and emerging economies.[25] The understanding that MSW has a value is not new. For at least thirty years, references to resource management and the idea of transforming municipal solid waste management to resource management have been made and discussed.[26] With the European Union (EU) and countries in Asia, such as Japan and China, incorporating elements of transforming MSWM to resource management into their legislative framework since the beginning of the 2000s,[27] many scholars, especially in recent literature, placed emphasis on the ongoing and very welcome transition from waste management to resource management around the globe. Especially as the value of waste increases in times of global resource scarcity, it is seen as a resource with business potential, rather than a burden on municipalities and citizens. The aspect of waste being a potential source of material and energy is all the more being addressed in literature on MSW in India. With its rising population, rising (average) incomes, increasing urbanisation levels and growing formation of the middle class, the country is an important global player when it comes to concerns about resource security and energy recovery.[28] In the literature which focusses

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[25] Le Courtois, "Municipal Solid Waste: Turning a Problem into Resource".

[26] Christine Furedy, "Challenges in Reforming the Philosophy and Practice of Solid Waste Management: A Social Perspective", *Regional Development Dialogue* 10, no. 3 (1989); World Health Organization, *World Health Organization Western Pacific Regional Centre for the Promotion of Environmental Planning and Applied Studies (Pepas): Summary of 1991 Activities* (Kuala Lumpur: Western Pacific Regional Centre for the Promotion of Environmental Planning and Applied Studies (PEPAS) World Health Organization, 1991) 4; Christine Furedy, "Garbage: Exploring Non-Conventional Options in Asian Cities", *Environment and Urbanization* 4, no. 2 (1992).

[27] European Commission, "The Sixth Environment Action Programme (6th EAP)", (European Commission, 2002); European Commission, "Roadmap to a Resource Efficient Europe", (Brussels: European Commission 2011); Ministry of Environment, "Fundamental Plan for Establishing a Sound Material-Cycle Society", (Government of Japan, 2003); Government of People's Republic of China, "Circular Economy Promotion Law of the People's Republic of China", Government of People's Republic of China, http://www.fdi.gov.cn/1800000121_39_597_0_7.html (last accessed April 10, 2019).

[28] Costas A. Velis, David C. Wilson, Ondina Rocca et al., "An Analytical Framework and Tool ('Intera') for Integrating the Informal Recycling Sector in Waste and Resource Management Systems in Developing Countries", *Waste Management & Research* 30 (2012); Samonporn Suttibak and Vilas Nitivattananon, "Assessment of Factors Influencing the Performance of Solid Waste Recycling Programs", *Resources, Conservation and Recycling* 53, no. 1 (2008); Le Courtois, "Municipal Solid Waste: Turning a Problem into Resource"; Jérémie Cavé, "Urban Solid Waste in Southern Countries: From a Blurred Object to Common Pool Resources" (paper presented at the World ISWA Congress 2012, Florence, September 2012); Chaturvedi, Vijayalakshmi, and Nijhawan, *Scenarios of Waste and Resource Management: For Cities in India and Elsewhere.*

on economic aspects of municipal solid waste management, the discussion around private sector participation plays a key role: with urban local bodies not being in a position to deliver the required MSWM services to a city, private sector involvement continues to be seen as a way to lift the burden off of the municipalities.[29]

Another strand of literature focusses on the environmental aspects of solid waste management, addressing environmental impacts of improper waste management. While on the one hand, some of the literature analyses climate change implications of waste management, other literature considers the physical components of this waste stream, and the technical aspects of waste management, when understanding context-appropriate and eco-friendly technologies or the environmental consequences of the use of inappropriate waste management technologies.[30]

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[29] Le Courtois, "Municipal Solid Waste: Turning a Problem into Resource"; Emmanuel Yeboah-Assiamah, Emmanuel Yeboah-Assiamah, Kwame Asamoah et al., "Decades of Public-Private Partnership in Solid Waste Management: A Literature Analysis of Key Lessons Drawn from Ghana and India", *Management of Environmental Quality: An International Journal* 28, no. 1 (2017); Tim Forsyth, "Building Deliberative Public–Private Partnerships for Waste Management in Asia", *Geoforum* 36, no. 4 (2005); Amandine Dukhan, Christel Bourbon-Séclet, and Nathalie Yannic, "Linking Public and Private Action for Sustainable Waste Management", *Private Sector and Development* 15 (2012); Sandra Cointreau-Levine, *Private Sector Participation in Municipal Solid Waste Services in Developing Countries*, vol. 1 (Washington, D.C.: The World Bank 1994); S Cointreau, P Gopalan, and A Coad, "Private Sector Participation in Municipal Solid Waste Management: Guidance Pack (5 Volumes)", *St. Gallen, Switzerland: Swiss Centre for Development Cooperation in Technology and Management (SKAT)* (2000); Adrian Coad, *Private Sector Involvement in Solid Waste Management: Avoiding Problems and Building on Successes* (Dt. Ges. für Technische Zusammenarbeit, 2005); Ashish Chaturvedi, Rachna Arora, and Manjeet Singh Saluja, "Private Sector and Waste Management in Delhi: A Political Economy Perspective", *IDS bulletin* 46, no. 3 (2015); Pariatamby Agamuthu and Tanaka Masaru, *Municipal Solid Waste Management in Asia and the Pacific Islands: Challenges and Strategic Solutions* (Springer, 2014).

[30] Yeboah-Assiamah, Yeboah-Assiamah, Asamoah et al., "Decades of Public-Private Partnership in Solid Waste Management: A Literature Analysis of Key Lessons Drawn from Ghana and India"; European Business and Technology Centre, *The Solid Waste Management Sector in India: An Overview of Research and Activity* (European Business and Technology Centre, 2011); Jean E. Bogner, "Waste Management: Overview, Technologies and Climate Change Implications" (paper presented at the WTO Workshop, Geneva, September 2009); Christian Zurbrügg, "Urban Solid Waste Management in Low-Income Countries of Asia How to Cope with the Garbage Crisis", in *Scientific Committee on Problems of the Environment (SCOPE)* (Durban, South Africa2002); Yeboah-Assiamah, Yeboah-Assiamah, Asamoah et al., "Decades of Public-Private Partnership in Solid Waste Management: A Literature Analysis of Key Lessons Drawn from Ghana and India"; David Wilson, Ljiljana Rodic-Wiersma, Prasad Modak et al., *Global Waste Management Outlook, United Nations Environment Programme (UNEP) and International Solid Waste Association (ISWA)* (United Nations Environment Programme 2015); Tapas Kumar Ghatak, "Municipal Solid Waste Management in India: A Few Unaddressed Issues", *Procedia Environmental Sciences* 35 (2016); LV Gangawane and VC Khilare, *Sustainable Environmental Management: Dr. Jayashree Deshpande Festschrift Volume* (Daya Books, 2007); Centre for Science and Environment, *Recommendations for Long Term Action Plan for Solid Waste Management in Delhi* (New Delhi: Centre for Science and Environment, 2017); P Costi, R Minciardi, M Robba et al., "An Environmentally Sustainable Decision Model for Urban Solid Waste Management", *Waste management* 24, no. 3 (2004); Sandra J Cointreau, *Environmental Management of Urban Solid Wastes in Developing Countries: A Project Guide* (Washington, D.C.: The World Bank, 1982); Chintan, *Waste-to-Energy or Waste-of-Energy. Social and Economic Impact Assessment of Waste-to-Energy Projects on Wastepickers near Ghazipur and Okhla Landfills in Delhi* (New Delhi: Chintan Environmental Research and Action Group, 2011); Chintan, *Cooling Agents: The Impact on the Informal Recycling Sector on Carbon Emissions* (New Delhi: Chintan Environmental Research and Action Group, 2009); PS Bundela, SP Gautam, AK Pandey et al., "Municipal Solid Waste Management in Indian Cities-a Review", *International journal of environmental sciences* 1, no. 4 (2010); Indian Network for Climate Change Assessment, *India: Greenhouse Gas Emissions 2007* (Ministry of Environment and Forests (MoEF), 2010).

The literature focussing on social aspects of waste management can be divided into two strands, one focussing on awareness and citizen engagement, and the other on the involvement of the informal waste workers. In particular, the role of informal workers in waste management in low- and middle-income countries as been the focus of intense debate among scholars. Within the group of waste workers, wherein one broadly distinguishes between waste pickers on the one hand, and waste dealers who deal with MSW—hence segregated waste—on the other, waste pickers have been studied extensively as examples of extremely disadvantaged urban workers. It is for this reason that much of the early literature in this field focusses on supporting waste pickers to exit the waste economy.[31] A change in perspective occurred only in the late 1980s, when the activities of waste pickers started to be considered as a relevant activity, saving valuable resources and, through this, creating a form of material circularity. From there the scholarly debates started to circle around the importance of "recognising" the role of the informal waste picker and the question of how to "integrate" waste pickers into a sustainable waste management system and formalise or legalise their activities.[32]

With the ongoing transition from waste management to resource management reaching urban India, the role of informal waste workers in this changing economy has become increasingly uncertain, which also reflects in the literature. Therefore, some scholars underline the urgent need to create awareness among governments and industries about the role of informal waste workers in order for them to play a role in the changing waste economy. A common understanding prevails among scholars about the importance of waste workers in low- and middle-income countries, who generally recover much larger amounts of waste than the formal sector,[33] with the informal sector in India handling up to 90 per cent of waste resource management.[34] "The informal sector, in spite of its informality, is well organised.

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[31] Furedy, "Challenges in Reforming the Philosophy and Practice of Solid Waste Management: A Social Perspective"; Furedy, "Garbage: Exploring Non-Conventional Options in Asian Cities"; Christine Furedy, *Reflections on Some Dilemmas Concerning Waste Pickers and Waste Recovery* (Urban Waste Expertise Programme of Waste, 1997).

[32] D.B. Shreshta, Ngo Thanh Loan, and O. Suraniranat, *A Reference Handbook for Trainers on Promotion of Solid Waste Recycling and Reuse in the Developing Countries of Asia* (United Nations Centre for Human Settlements UN-Habitat, 1994); Furedy, *Reflections on Some Dilemmas Concerning Waste Pickers and Waste Recovery*.

[33] Seth Schindler, Federico Demaria, and Shashi B Pandit, "Delhi's Waste Conflict", *Economic and Political Weekly* 47, no. 42 (2012); Ellen Gunsilius, Sandra Spies, Sofia García-Cortes et al., *Recovering Resources, Creating Opportunities: Integrating the Informal Sector into Solid Waste Management* (Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, 2011); Ellen Gunsilius, Bharati Chaturvedi, and Anne Scheinberg, *The Economics of the Informal Sector in Solid Waste Management* (Eschborn: GIZ- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH CWG - Collaborative Working Group on Solid Waste Management in Low- and Middle-income Countries, 2011).

[34] Mufeed Sharholy, Kafeel Ahmad, Gauhar Mahmood et al., "Municipal Solid Waste Management in Indian Cities–a Review", *Waste management* 28, no. 2 (2008); Sunita Narain and Swati Singh Sambyal, *Not in My Backyard. Solid Waste Management in Indian Cities* (New Delhi: Centre for Science and Environment 2016).

Also, the services provided are efficient as well as convenient—two necessary characteristics of waste management systems globally."[35] The narratives in the existing literature therefore revolve around questions related to the integration of informal waste workers into an efficient and equitable waste management system that is also environmentally sound, and around questions of requirements for a transition from waste management to resource management.

In the specific literature on MSWM in Delhi, some parts of the literature connect the political and social aspects by placing emphasis on the transition towards a privatised solid waste management system in the city and its impact on the waste workers. Here, scholars focus on political and policy processes in the recent past, in which "[…] instead of seeking to capitalise on the effectiveness of the informal sector and institutionalising its participation in waste management, the M[unicipal] C[orporation] [of] D[elhi] sought to radically transform solid waste management."[36] Most previous work in this area has concentrated on either specific recent policy developments and certain processes in the context of Delhi's MSWM economy, or selective actors in that context and their specific roles.[37]

The governance aspect of municipal solid waste management in urban areas of India has received less attention from policy makers and scholars than has been paid to other urban environmental problems, such as air pollution or sanitation.[38] Notwithstanding the fact that the improper handling and disposal of MSW constitutes a serious problem because the failure

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[35] Chaturvedi, Vijayalakshmi, and Nijhawan, *Scenarios of Waste and Resource Management: For Cities in India and Elsewhere*, 10.

[36] Schindler, Demaria, and Pandit, "Delhi's Waste Conflict", 19.

[37] Michael Köberlein, *Living from Waste: Livelihoods of the Actors Involved in Delhi's Informal Waste Recycling Economy* (Verlag für Entwicklungspolitik, 2003); Seth Schindler and Brij Kishore, "Why Delhi Cannot Plan Its 'New Towns': The Case of Solid Waste Management in Noida", *Geoforum* 60 (2015); Schindler, Demaria, and Pandit, "Delhi's Waste Conflict"; Papiya Sarkar, "Solid Waste Management in Delhi–a Social Vulnerability Study" (paper presented at the Proceedings of the third international conference on environment and health, Chennai, India, 2003); Amarjit S Narang and MA Warith, *Engaging Communities in Waste Management: A Policy-Oriented Study of Delhi, Toronto and Silchar* (New Delhi: Shastri Indo-Canadian Institute, 2006); Vandana Mathur, "Scope of Recycling Municipal Solid Waste in Delhi and National Capital Region (NCR)", *Integral Review: A Journal of Management* 5, no. 2 (2012); Yujiro Hayami, AK Dikshit, and SN Mishra, "Waste Pickers and Collectors in Delhi: Poverty and Environment in an Urban Informal Sector", *The Journal of Development Studies* 42, no. 1 (2006); Bhavik Gupta and Shakti Kumar Arora, "A Study on Management of Municipal Solid Waste in Delhi", *Journal of Environment and Waste Management* 3, no. 1 (2016); Archana Ghosh, *Solid Waste Management in Delhi: An Exploratory Study on Local Government-Community Interface*, vol. 14 (Institute of Social Sciences, 2000); Federico Demaria and Seth Schindler, "Contesting Urban Metabolism: Struggles over Waste-to-Energy in Delhi, India", *Antipode* 48, no. 2 (2016); A Chowdhary, P Sarkar, R Agarwal et al., *Recycling Responsibility: Traditional Systems and New Challenges of Urban Solid Waste in India* (New Delhi: Sristhi, 2002); Bharati Chaturvedi, "Privatization of Solid Waste Collection and Transportation in Delhi: The Impact on the Informal Recycling Sector", *Paper prepared as partial fulfilment of course on Urban Issues in Developing Countries, School for Advanced International Studies, Johns Hopkins University. Washington DC* (2006); Bharati Chaturvedi, *Finding Delhi: Loss and Renewal in the Megacity* (Penguin Books India, 2010); Chaturvedi, Arora, and Saluja, "Private Sector and Waste Management in Delhi: A Political Economy Perspective"; Ankit Agarwal, Ashish Singhmar, Mukul Kulshrestha et al., "Municipal Solid Waste Recycling and Associated Markets in Delhi, India", *Resources, Conservation and Recycling* 44, no. 1 (2005).

[38] Martin Medina, *Solid Wastes, Poverty and the Environment in Developing Country Cities: Challenges and Opportunities* (World Insitute for Development Economics Research United Nations University, 2010) 1; Ljiljana Rodic and David C Wilson, "Resolving Governance Issues to Achieve Priority Sustainable Development Goals Related to Solid Waste Management in Developing Countries", *Sustainability* 9, no. 3 (2017).

of solid waste management systems can result in serious environment and health risks and social justice concerns, as is the case in Delhi. When addressing the issues of MSWM, it is fundamentally necessary to understand the complexity of the issues related to waste, which are, environmental policy, urban planning and infrastructure, social justice, institutional structure and health.

In the present research, an attempt is being made to add to the literature on the governance-related aspect of MSWM through a better understanding of the past and current developments and processes in India's MSWM policy framework, and Delhi's MSWM economy. This is in order to provide a clearer outlook for the waste future of the city. This research focuses on governance issues concerning Delhi's municipal solid waste management system by identifying selective drivers of change for municipal solid waste management at a policy level and assigning approaches to specific stakeholders. Focussing on dynamics and processes rather than technologies, on this occasion, the three aspects— political, environmental and social—are being brought together and attention is directed at the dynamics, correlations and interlocking between the various stakeholders and their involvement and impact in policy level developments, as well as developments on the ground.

1.4. Methodology and Conceptual Framework

Concerned with the causes and effects of India's MSWM policy framework and its impacts on the MSW economy in Delhi, this qualitative research is based on a mixed methodology using four data collection and research methods. First, this research is backed up by an extensive review of the existing primary and secondary literature; here, a combination of a systematic literature search and snowball method was applied. The literature study includes municipal solid waste management books, research papers, peer-reviewed journal publications, reports from the private sector and non-governmental organisations (NGOs) and online resources. During the systematic literature search, the following tags and keywords were applied in the Primus Gateway catalogue of the University Library of Humboldt-Universität zu Berlin, in the HEIDI catalogue for libraries of Heidelberg University and in Google Scholar: 'municipal solid waste', 'municipal solid waste India', 'municipal solid waste management policies India', 'environment and waste India', 'municipal solid waste management agenda India', 'municipal solid waste Delhi', 'municipal solid waste economy India', 'transformations of Delhi's municipal solid waste economy', 'informal waste sector India', 'informal waste sector Delhi', 'informal waste workers Delhi', 'private sector participation Delhi', 'circular economy India', 'waste to resource India', 'resource efficiency India', 'waste to resource initiatives Delhi'. This data collection is underpinned by the constant screening

of related newspaper and magazines articles in *Business Standard, DNA India, Down to Earth, Economic & Political Weekly, Financial Express, Firstpost, Frontline, Hindustan Times, India Spend, India Today, Tehelka, The Economic Times, The Hindu, The Indian Express, The New Indian Express, The Statesman, The Times of India* and the *The Week*. Second, the public policy analysis draws on primary material in the form of almost forty MSW-related government documents[39], which have been published in the period between 1986 and 2016, such as legislative documents, guidelines, toolkits and reports by a variety of ministries and government bodies, such as the Ministry of Environment, Forest and Climate Change (MoEFCC), Ministry of Urban Development (MoUD), Ministry of Finance (MoF), Central Pollution Control Board[40] (CPCB), the Planning Commission[41] and the National Institution for Transforming India (NITI Aayog). Third, between 2014 and 2017, the author was a participant-observer in Delhi to study the experiences of legislators, implementers, informal waste workers and community members who are involved in the agenda setting and implementation of India's MSWM framework. By being present at twenty workshops and conferences[42], on the broader topic of MSW, the author was in a position to participate in, witness and observe in-depth discussions among key stakeholders on India's municipal solid waste management agenda and Delhi's waste economy. The role of the participant-observer gave the author the required proximity and familiarity to interact with the actors from the public, private (formal and informal) and community realm, and the ability to gather data off the record, while also practicing a necessary detachment to remain objective and in a position to understand the broader scenario. The collected data, which is partly in the form of quotations, is incorporated in this research. However, all quotations are anonymised, mentioning only the place, month and year the quotation was made, and the field, e.g. public sector, private sector (formal and informal) and community level, to which the cited individual belongs. Fourth, this qualitative study is based on twenty-eight semi-structured interviews with stakeholders from all three fields (public, private [formal and informal] and community), with a special focus on informal waste workers and community level representatives. These were conducted

[39] See Appendix-I: Inventory of Relevant Municipal Solid Waste Government Policy Documents for the inventory of government documents related to MSWM.
[40] The CPCB is a statutory authority, attached to the MoEFCC. It was constituted in 1974 in order to implement provisions of the Water (Prevention and Control of) Pollution Act, 1974. At the state and union territory level, the State Departments of Environment and State Pollution Control Boards (SPCBs) and Pollution Control Committees (PCCs) are the agencies with equivalent responsibilities.
[41] The Planning Commission was a Government of India institution which, among other functions, formulated India's Five-Year Plans. In his first Independence Day speech in 2014, Prime Minister Narendra Modi announced the dissolution of the Planning Commission and its replacement by the National Insitution of Transforming India, or NITI Aayog, the government's premier think tank.
[42] See Appendix-II: Inventory of Attended Conferences and Workshops.

between February 2016 and July 2017 in Delhi. The reason for focussing on waste workers and community level representatives (excluding NGO representatives) in the semi-structured interviews is that the participant observation method gave the author access to data of mostly public sector representatives, private formal sector representatives and NGO representatives, as actors from these three fields were predominately present in the mentioned conferences and workshops. In order to have a balanced approach to the topic and to be able to include voices from all three fields, the author (not exclusively) focussed on waste workers and community representatives in the interviews. Applying a snowball sampling method, the author interviewed twelve waste workers from Delhi's informal waste economy, ten community representatives (excluding NGO representatives), and six representatives from the public and private formal sector, as well as NGO representatives. While the community level and public and formal private interviews were conducted in English, the interviews with waste workers were partly conducted in Hindi, for which the author involved a person whose mother tongue was Hindi. In the course of the first interviews, five participants from all three fields requested anonymity. Therefore, while specifying the date of the respective interview, the author anonymised detailed personal and professional data of all interviewees. In the case of waste workers, the quotes are assigned the abbreviation WW (waste worker), and the non-anonymised information includes the first name, age and area in Delhi where they work. In the case of the community level representatives (excluding NGO representatives), the non-anonymised information includes the first name, age and the area of residence. For all other interviewees, the non-anonymised information includes the field, e.g. public sector, private sector (formal and informal) and community level (NGO representative etc.), to which the cited individual belongs. Overall, all interviewees—once informed that no specific information about their person will be included in this research—seemed to be relieved and more open when they spoke. Moreover, for reasons of anonymity and privacy, this research neither includes pictures of any of the interviewees nor of street scenarios in which formal or informal waste workers are depicted.

Since this is a research which aims to contribute to the MSWM debate by understanding India's and Delhi's municipal solid waste management challenge from a conceptual point of view, it was conducted against the backdrop of two practical–conceptual approaches, which are also applied by the government of India. The institutional framework is analysed by developing an inventory of relevant legal and policy documents related to municipal solid waste

since 1986. Here the aim is to first identify selective key development[43] drivers and factors for municipal solid waste management in India, and then cluster the government documents along the lines of the identified development drivers in order to build a basis for a status quo of India's past and present solid waste management frame. The purpose is to understand what has shaped political developments over the past thirty years in the Indian MSW context. This is an essential prerequisite for reaching a clearer understanding of how to move forward when developing and establishing a sustainable MSW system in India.

In this research, India's MSW policy framework is analysed against the backdrop of the 'waste hierarchy' concept. As outlined in Figure 1, the waste hierarchy concept is a five-step inverted pyramid, which essentially emphasises the need to move away from disposal and instead encompasses the elements of 3R (reduce, reuse, recycle) by moving towards the more sustainable and environment-friendly options of reduction, reuse and recycling. The underlying understanding of the concept is, that every product has a life-cycle[44] which needs to be assessed in order to examine the environmental impact.[45] The origin of the waste hierarchy concept lies in the member states of the European Union. The basic elements of the waste hierarchy concept, which since the 2000s is the "(…) the guiding framework for EU and national waste policies (…)"[46] were already introduced in the 1975 Waste Framework Directive.[47] Only by 2008 the overall concept has been incorporated in the EU's legislative framework.[48] With the EU member states and countries in Asia such as Japan and China incorporating elements of the waste hierarchy understanding into their legislative framework since the beginning of the 2000s[49], this concept has become a kind of 'norm', which is to be

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[43] The term 'development' is complex, and its meaning varies depending on the context the term is used in. As such, the World Bank's idea of development is very different from the idea of development that an organisation such as Chintan has. In the context at hand, development—indeed a political term—is understood as a process which is dynamic and involves the participation of a variety of actors. Development is understood as change, ideally a positive change, such as an improvement of a condition or state. In the case of MSWM, development is understood as improvement in the state of the environment, the social and economic conditions of the waste workers involved, the state of public health and the overall MSWM economy.

[44] The Life-Cycle Assessment (LCA) or Life-Cycle Analysis is a tool for examining the environmental impact of a product through the entire product lifecycle: extraction/mining, product design, production/manufacturing, consumption and waste generation.

[45] David C Wilson, "Development Drivers for Waste Management," *Waste Management & Research* 25, no. 3 (2007): 200.

[46] European Environment Agency, *Waste Prevention in Europe - the Status in 2014* (European Environment Agency, 2015) 7.

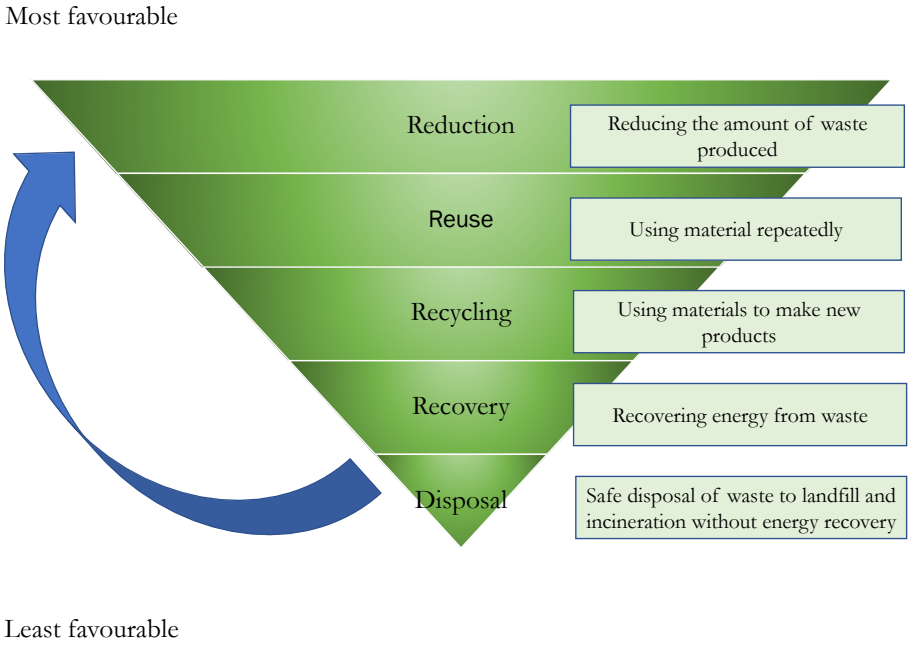
[47] European Environment Agency, "Council Directive 75/442/Eec of 15 July 1975 on Waste," (European Environment Agency 1975).

[48] European Commission, "Directive 2008/98/Ec on Waste (Waste Framework Directive)," (European Commission, 2008).

[49] European Commission, "The Sixth Environment Action Programme (6th Eap)."; European Commission, "Roadmap to a Resource Efficient Europe."; Ministry of Environment, "Fundamental Plan for Establishing a Sound Material-Cycle Society."; Government of People's Republic of China, "Circular Economy Promotion Law of the People's Republic of China".

followed in order to identify and then further develop suiting MSW solutions. Hence, this concept, especially as it is also a concept the Indian government is building on, is an interesting basis and starting point for an analysis of the Indian MSWM policy framework. In the research at hand, the waste hierarchy concept is not taken as a static rule which shall be applied in the Indian context, but rather as a guiding principle and tool for analysis, from which to draw elements for MSWM solutions fitting the Indian context.

Figure 1: The waste hierarchy concept



Source: Based on EC (2008).

When narrowing down to the city level, actor perspectives, interests, objectives and interrelations in the broader institutional and political context are being considered in order to analyse Delhi's waste management agenda and to understand who drives the implementation of MSW policies and who slows it down. The actor landscape of Delhi's MSWM economy is as diverse as it is dynamic and is shaped by various public and private actors and their objectives, alliances and conflicts among those actors. Being primarily concerned with the relations between Delhi's MSWM actors and the existing structure within which they operate, clustering the relevant actors and focussing on their actions at particular turning points is essential. The stakeholders involved in Delhi's MSWM economy as well as the turning points and transitions of Delhi's MSWM economy are being analysed against the backdrop of the Integrated Sustainable Waste Management (ISWM) framework.

As outlined in Box 2 the ISWM concept is an analytical framework for the assessment of waste management services, which takes into account three major dimensions: (1) the stakeholders involved in waste management, (2) the (practical and technical) elements of the waste system, and (3) the aspects of the local context that should be taken into account when assessing and planning a waste management system. In the ISWM framework, a sustainable waste management system is understood as a policy umbrella which protects a mix of infrastructure in the form of technologies and institutions. Apart from analysing a variety of aspects such as institutional, social, political and environmental, one of the key messages of the concept is that all stakeholders, including waste workers, need to be engaged and involved in a sustainable waste management system.[50] As the topic of integration of Delhi's waste workers has been continuously discussed over the years[51], addressing the aspect of waste workers engagement and integration in this way makes this concept especially relevant for the MSWM context in Delhi.[52]

Box 2: The framework of integrated sustainable waste management (ISWM)

Integrated sustainable waste management (ISWM) is a framework that was first co-created in the mid-1980s by WASTE, a Dutch NGO, alongside their partners. Until then, solid waste management was seen as a technical challenge. The ISWM framework concretised what had already become clear during the beginning of the 1980s: that municipalities could not collect and remove waste in a silo-like manner, but would require a policy framework and an institutionalised setting, matching local conditions, to act in. In addition to this, waste generators would need to collaborate with the municipalities in order for them to be able to tackle the issue.

ISWM, as outlined in the figure below, recognises three dimensions which need to be considered when changing a solid waste management system:

1. Engagement of multiple stakeholders

[50] UN-Habitat, *Solid Waste Management in the World's Cities*, 23.

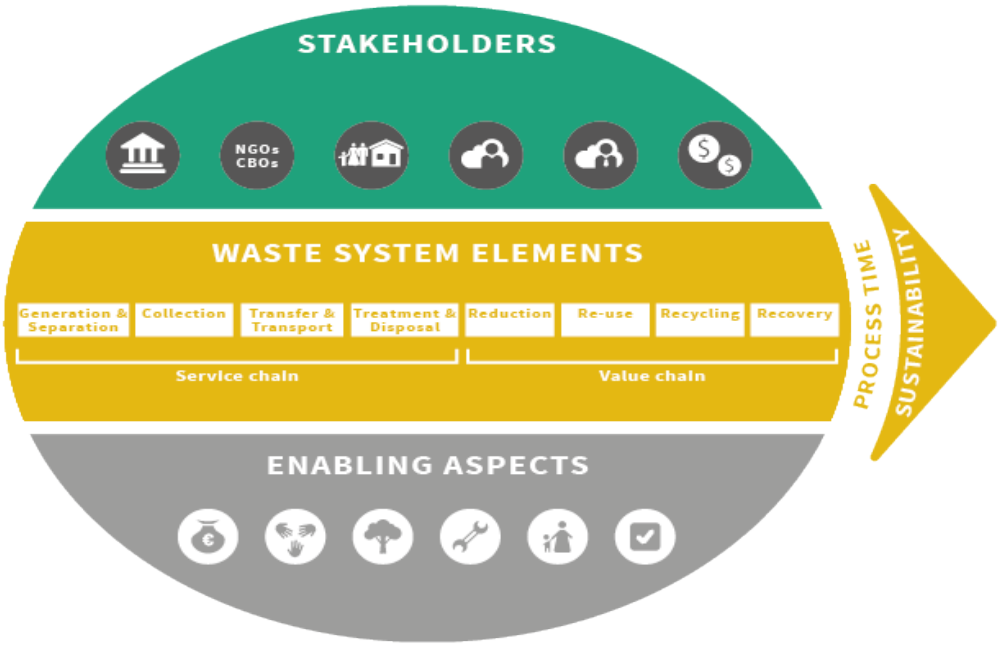
[51] Furedy, *Reflections on Some Dilemmas Concerning Waste Pickers and Waste Recovery*; Peter Gerdes and Ellen Gunsilius, *The Waste Experts: Enabling Conditions for Informal Sector Integration in Solid Waste Management: Lessons Learned from Brazil, Egypt and India* (Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH, 2010).

[52] Köberlein, *Living from Waste: Livelihoods of the Actors Involved in Delhi's Informal Waste Recycling Economy*; Hayami, Dikshit, and Mishra, "Waste Pickers and Collectors in Delhi: Poverty and Environment in an Urban Informal Sector"; Rémi de Bercegol, Jérémie Cavé, and Arch Nguyen Thai Huyen, "Waste Municipal Service and Informal Recycling Sector in Fast-Growing Asian Cities: Co-Existence, Opposition or Integration?", *Resources* 6, no. 4 (2017); Rémi de Bercegol, Jérémie Cavé, and Arch Nguyen Thai Huyen, "Informal Recycling Vs Municipal Waste Service in Asian Cities: Opposition or Integration to Municipal Service?", *AFD Research Paper Series*, no. 2018-64 (2018); Bharati Chaturvedi and Vinay Gidwani, "The Right to Waste: Informal Sector Recyclers and Struggles for Social Justice in Post-Reform Urban India", in *India's New Economic Policy: A Critical Analysis* ed. Waquar Ahmed, Amitabh Kundu, and Richard Peet (Routledge, 2010); Chaturvedi, "Privatization of Solid Waste Collection and Transportation in Delhi: The Impact on the Informal Recycling Sector".

a. Local authority
b. National environment and local government ministries
c. Private formal waste companies
d. Informal waste workers
e. Waste generators

2. Practical and technical elements of a waste management system as per the understanding of the waste hierarchy concept. Technical elements are one of three parts of the overall framework.
3. Sustainable operational, financial, social, institutional, political, legal and environmental aspects in order for the waste management system to be locally sustainable and feasible in the respective local context.

'Integrated' in ISWM emphasises the interdependencies between all three dimensions.



Source: www.waste.nl (last accessed April 3, 2019).

The meaning of 'integration' of waste workers has developed over the years and differs depending on the source and context.[53] The variations range from understanding integration as a form of either recognition, acknowledgement, formalisation, legalisation, permission or routinisation of the waste workers' activities. These various understandings of integration of waste workers in the context of Delhi's MSWM are an element in the course of analysing Delhi's MSWM economy.

[53] Furedy, *Reflections on Some Dilemmas Concerning Waste Pickers and Waste Recovery*; Gerdes and Gunsilius, *The Waste Experts: Enabling Conditions for Informal Sector Integration in Solid Waste Management: Lessons Learned from Brazil, Egypt and India.*

2. A Contextualisation of Municipal Solid Waste in India and Delhi

Municipal solid waste is usually considered 'urban', as waste generation in rural areas is in general much lower and has a different composition of materials from urban waste.[54] While the definition of MSW varies between countries, it also varies between regions and cities within a country. Box 3 is a compilation of definitions of MSW by four different organisations and institutions, which points out the variety of understandings of what is being included in the frame of MSW.[55]

Box 3: Definitions of municipal solid waste

By the Organisation for Economic Co-operation and Development (OECD): Municipal waste is defined as waste collected and treated by or for municipalities. It covers waste from households, including bulky waste, similar waste from commerce and trade, office buildings, institutions and small businesses, as well as yard and garden waste, street sweepings, the contents of litter containers, and market cleansing waste if managed as household waste. The definition excludes waste from municipal sewage networks and treatment, as well as waste from construction and demolition activities. This indicator is measured in thousand tonnes and in kilograms per capita.

By the Intergovernmental Panel on Climate Change (IPCC): Municipal waste is generally defined as waste collected by municipalities or other local authorities. However, this definition varies by country. Typically, MSW includes household waste, garden (yard) and park waste, and commercial/institutional waste.

By United Nations Environment Programme (UNEP): While the definition of MSW varies widely between countries, household wastes are always included, as are some C&I and C&D wastes from smaller businesses and institutions. In principle, C&I and C&D wastes from larger waste generators remain the direct responsibility of the waste generator, rather than passing on to the city authorities. However, these distinctions are often 'fuzzy' in cities of developing countries— by default, the city often manages all the waste generated in the municipal area, including C&I and C&D.

[54] Hoornweg and Bhada-Tata, *What a Waste: A Global Review of Solid Waste Management*, 2–4.
[55] Organisation for Economic Cooperation and Development, "Municipal Waste" Organisation for Economic Cooperation and Development, https://data.oecd.org/waste/municipal-waste.htm (last accessed 8 April, 2019); Wilson, Rodic-Wiersma, Modak et al., *Global Waste Management Outlook, United Nations Environment Programme (UNEP) and International Solid Waste Association (ISWA)*, 25; Hoornweg and Bhada-Tata, *What a Waste: A Global Review of Solid Waste Management*, 6; Intergovernmental Panel on Climate Change (IPCC), *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (Intergovernmental Panel on Climate Change (IPCC), 2006) 2.5.

By the World Bank (WB): MSW encompasses residential, industrial, commercial, institutional, municipal, and construction and demolition (C&D) waste.

Sources: Data from IPCC (2006), 2.5; OECD, https://data.oecd.org/waste/municipal-waste.htm (last accessed April 8, 2019); UNEP (2015), 25; and WB, http://www.worldbank.org/en/topic/urbandevelopment/brief/solid-waste-management (last accessed April 8, 2019).

While all four organisations agree on MSW covering household waste, institutional and commercial waste, they take a different stand in relation to MSW comprising industrial waste, market residue or street sweeping. One significant difference among the four definitions is in relation to C&D waste, on which all four take a different stand: while the World Bank considers C&D waste as a part of MSW, the OECD categorically excludes C&D waste as a part of MSW, and the IPCC does not mention C&D waste in their definition. The United Nations Environment Programme points out that C&D waste usually remains the responsibility of the respective generator and highlights that "these distinctions are often 'fuzzy' in developing country cities—by default, the city often manages all the waste generated in the municipal area, including C&I and C&D."[56] These variations in MSW definitions underline the complexity of the topic at hand. It is therefore important to outline the MSW definition that this research is based upon.

Considering the Indian context, it is important to take a closer look at the definition of MSW on which the solid waste rules from 2000 and 2016 are based. In the Municipal Solid Wastes (Management and Handling) Rules, 2000, the then Ministry of Environment and Forests (MoEF)[57] defines MSW as "[…] commercial and residential wastes generated in a municipal or notified areas in either solid or semi-solid form excluding industrial hazardous wastes but including treated bio-medical wastes."[58] While the overall definition in the first set of MSW rules remains rather vague, it all the more manifests a grey zone in regard to C&D waste, as the rules include C&D waste management recommendations, making C&D waste essentially part of MSW. As mentioned earlier, it was only in 2016, when the MoEFCC notified the first specific Construction and Demolition Waste Management Rules, 2016 that the distinctions between the MSW waste stream and the C&D waste stream became more specific.

[56] Wilson, Rodic-Wiersma, Modak et al., *Global Waste Management Outlook, United Nations Environment Programme (UNEP) and International Solid Waste Association (ISWA)*, 25.
[57] In May 2014, the MoEF was renamed the Ministry of Environment, Forest and Climate Change.
[58] Ministry of Environment & Forests, "Municipal Solid Wastes (Managment and Handling) Rules, 2000", (New Delhi: Government of India, 2000), 3 (xv).

In the Solid Waste Management Rules, 2016, the MoEFCC goes into more detail and embeds a definition of solid waste which reads:

> (…) "solid waste" means and includes solid or semi-solid domestic waste, sanitary waste, commercial waste, institutional waste, catering and market waste and other non residential wastes, street sweepings, silt removed or collected from the surface drains, horticulture waste, agriculture and dairy waste, treated bio-medical waste excluding industrial waste, bio-medical waste and e-waste, battery waste, radio-active waste generated in the area under the local authorities and other entities mentioned in rule 2 (…).[59]

The definition of MSW in the Indian context includes a variety of fractions, such as silt, treated bio-medical waste and sanitary waste, among others, which, as highlighted in Table 1, do not specifically occur in the definitions of OECD, IPCC, UNEP and WB.

Table 1: Types of waste in MSW definitions

	OECD	IPCC	UNEP	WB	GoI
Household waste	✓	✓	✓	✓	✓
Commercial waste	✓	✓	✓	✓	✓
Institutional waste	✓	✓	✓	✓	✓
Industrial waste				✓	
Small businesses waste	✓				
Garden, yard & park waste/horticulture waste	✓	✓			✓
Market waste	✓				✓
Street sweeping	✓				✓
Silt					✓
Litter containers' waste	✓				
C&D waste			(✓)	✓	
Sanitary waste					✓
Agriculture & dairy waste					✓
Treated bio-medical waste					✓

Sources: Author's own, based on data from IPCC (2006); MoEFCC, "Solid Waste Management Rules (2016); OECD, https://data.oecd.org/waste/municipal-waste.htm (last accessed April 8, 2019); UNEP (2015); and WB, http://www.worldbank.org/en/topic/urbandevelopment/brief/solid-waste-management (last accessed April 8, 2019).

These different views on the material included in MSW not only highlight the complexity of the issue, but also the intertwined necessity of diverging strategies when it comes to a functioning MSW management. Diverse understandings of the MSW frame need diverse and

[59] Ministry of Environment, Forest and Climate Change, "Solid Waste Management Rules, 2016", (New Delhi: Government of India, 2016), 54.

context-related approaches to handle the waste. The fact that the material compositions of MSW streams vary significantly between countries, regions and cities adds to this complexity. An important difference, especially between countries in the Global North and countries in the Global South, is the dissimilar amount and characteristics of MSW generated. While on the one hand, the amount of MSW generated tends to increase as income increases, as is the case in countries of the Global South, on the other hand, the composition of MSW tends to be different in low- and middle-income countries. In countries of the Global South, MSW contains a large percentage of organic materials, usually three times higher than that of countries in the Global North. As such, MSW is also denser and more humid due to the prevalent consumption of fresh fruits and vegetables, as well as unpackaged food. People in the Global North consume more processed food and food packaged in cans, bottles, jars and plastic containers than in countries of the Global South.[60] This difference in waste composition and consumption patterns is yet another important aspect which needs to be kept in mind when looking at India's MSW stream.

2.1. India's and Delhi's MSW—Its Composition and Generation

India's municipal solid waste can be broadly classified into biodegradable and non-biodegradable material, and recyclable and non-recyclable material. This categorisation can be further split into biodegradable waste, comprising food waste, vegetable market waste, and yard waste, and recyclables, comprising paper, plastic, rubber, glass and metals. Inert waste is the fraction of waste that cannot be composted or recycled, which includes concrete, asphalt, dirt, debris, street sweeping material, etc. According to the World Bank, when a country's level of urbanisation increases, and the population becomes wealthier, the consumption of inorganic material increases and the relative organic fraction decreases. This phenomenon is, as presented in the following sub-sections, also visible in urban India, as the composition of MSW has changed dramatically in recent years and different types of packaging material flood consumer markets.[61]

Before going into the details of India's and Delhi's respective MSW composition and generation data, it is important to note that inconsistencies in MSW data have reoccurred throughout the period of research. While official government documents contradict each other in MSW data, so does secondary literature. Moreover, the existing MSW data gap has been a constant narrative at conferences and workshops, underlining the need for a stronger engagement of policy makers and academics in this field. In what follows, an attempt has

[60] Medina, *Solid Wastes, Poverty and the Environment in Developing Country Cities: Challenges and Opportunities*, 4.
[61] Gidwani and Reddy, "The Afterlives of "Waste": Notes from India for a Minor History of Capitalist Surplus".

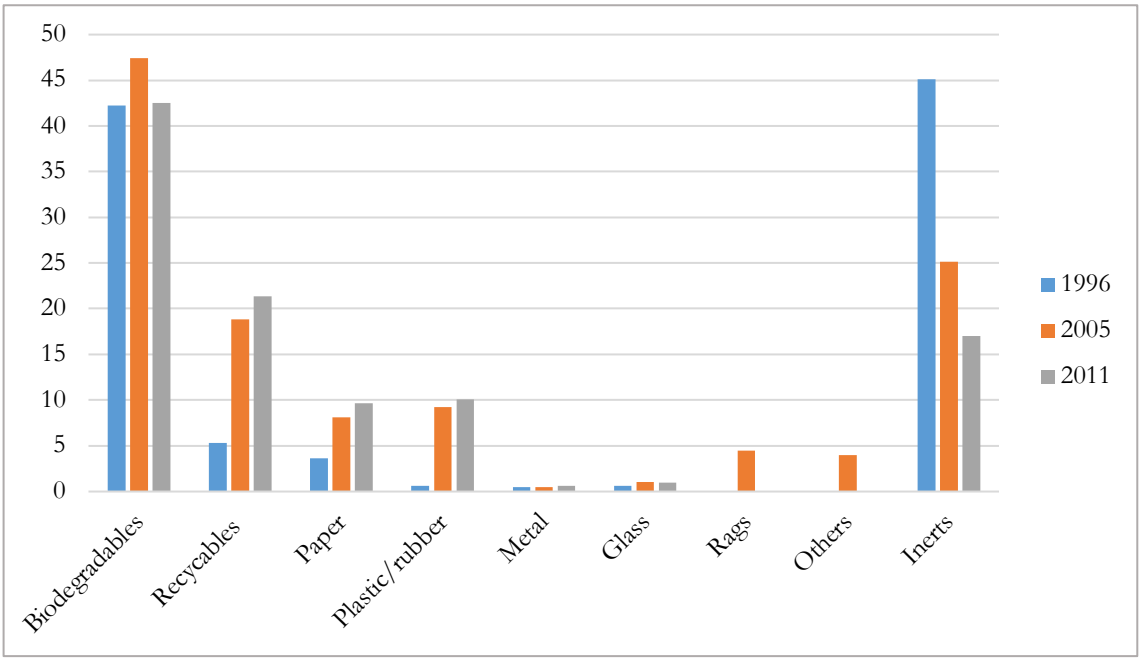
been made to address this hurdle by highlighting significant discrepancies, and contrasting the inconsistencies accordingly.

2.1.1. India's MSW Composition

While the composition of MSW in high-income countries is usually characterised by 20 to 30 per cent organic material, more than 50 per cent recyclables and an inert fraction of around 20 per cent, the MSW composition in lower and upper middle-income countries usually consists of more than 50 per cent organic waste, around 20 per cent recyclables and around 20 per cent inert.[62] This trend is also visible when looking at the available figures for India, and here especially at the post-2000 data, as depicted in Graph 3. Graph 3 shows the changes in MSW composition in India from 1996 till 2011 according to a report published by the Planning Commission in 2014. The proportion of organic material is usually the highest in low- and middle-income countries, which is also the case in India, as the fraction of biodegradable material in MSW in India throughout the years was between 40 to 50 per cent of the total MSW.[63] One significant development throughout these years is in relation to recyclables: these figures show an increasing trend, with a share of around 5 per cent of the overall MSW composition in 1996 and more than 20 per cent in 2011. As depicted in Graph 3, within this fraction the amount of plastic and paper makes the significant difference. While the share of paper was more than 3 per cent in 1996, it was almost 10 per cent of the total MSW by 2011. The rise in the proportion of plastic is even higher, as it was below 1 per cent in 1996 and had reached more than 10 per cent by 2011, which results in an increment of plastic waste production of 1,585 per cent in 15 years. The increment of packaging material such as paper and plastic are usually considered a symptom of economic growth, increasing incomes and changing consumption patterns – a development which is also the case in India. The share of the inert section amounted to more than 45 per cent in 1996 and had, according to the Planning Commission, decreased to around 20 per cent until 2011.

[62] Hoornweg and Bhada-Tata, *What a Waste: A Global Review of Solid Waste Management*, 19.
[63] Ibid., 16.

Graph 3: Percentage composition of India's MSW in 1996, 2005 and 2011

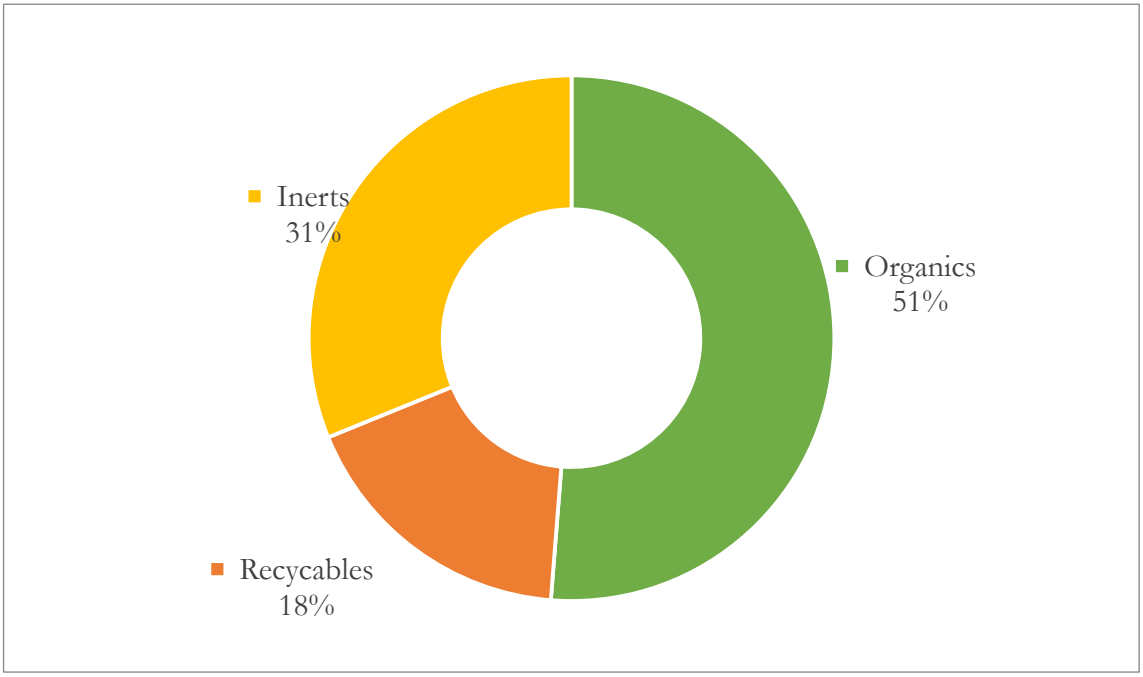


Source: Data from Planning Commission, "Report of the Taskforce on Waste to Energy 2014" (New Delhi: Government of India, 2014), 54.

The aforementioned data inconsistency becomes evident when looking at the fraction of inert waste since the figures vary significantly depending on the source. Construction and demolition waste material such as wood, steel, concrete, dirt, bricks and tiles, has been by default part of the fraction of inert waste, which plays a specific role in the MSW waste stream, as it often accounts for 40 per cent of the overall MSW amount. Some sources estimate an annual generation of 12 million tonnes of inert waste (including street sweeping and C&D waste) in India, which is one-third of the total MSW.[64] Graph 4 underlines this estimation with a depiction of a 31 per cent proportion of inert waste of the total MSW in 2012. This would mean an increment of almost 50 per cent from 2011 to 2012, as the figure for 2011, which was published by the Planning Commission, is 17 per cent inert, as shown in Graph 3.

[64] Rajkumar Joshi and Sirajuddin Ahmed, "Status and Challenges of Municipal Solid Waste Management in India: A Review", *Cogent Environmental Science* 2, no. 1 (2016): 2.

Graph 4: Percentage composition of MSW in urban India in 2012



Source: Data from Annepu (2012), 4.

2.1.2. India's Waste Generation

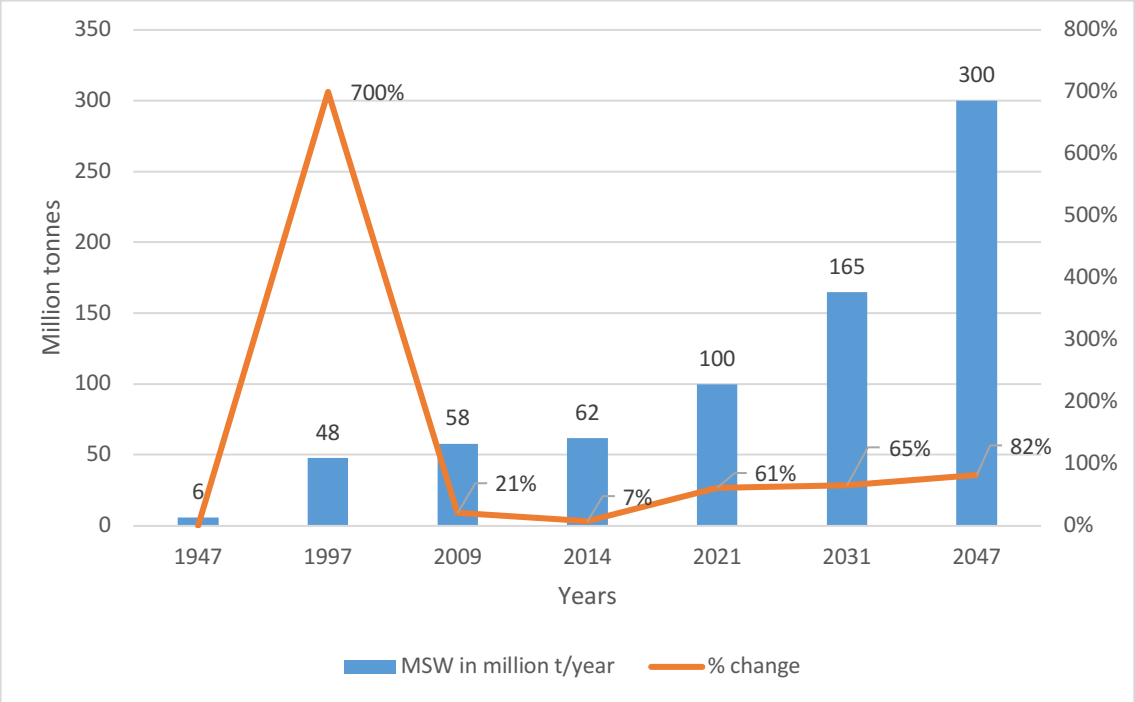
A combination of factors including rapid urbanisation, increasing incomes, changing life-styles and economic trends lead to rapidly increasing MSW generation in India. While the MSW increment is a given fact for all stakeholders involved, the MSW generation figures itself are less factual. One of the presumed reasons for the data gap is that all estimations are directly linked to the Assessment of Status of Municipal Solid Wastes Management in Metro Cities and State Capitals report, which was published in 2005 by the CPCB and produced by the National Environmental Engineering Research Institute (NEERI), which presumably contains real time data and figures of MSW generation in fifty-nine Indian cities.[65] All the figures mentioned in the following publications derive directly from this report, as the MSW data is being generated by multiplying the figure of the urban population by the quantity of waste generated per person per day. The involvement of waste workers in the MSW economy adds to the existing inaccuracy of data, as their activities can often not be tracked and therefore not be registered.

Although inconsistent and partly conflicting, the existing data agrees in one point and demonstrates that clearly: MSW generation in India continues to rise, with bigger and economically stronger cities to produce more MSW in the future. In order to establish an idea

[65] Narain and Singh Sambyal, *Not in My Backyard. Solid Waste Management in Indian Cities*, 4; Central Pollution Control Board, *Municipal Solid Wastes (Management and Handling) Rules, 2000. Annual Report 2004-2005* (New Delhi: Ministry of Environment & Forests, 2005) 5.

of India's MSW generation's past, present and future, Graph 5 depicts the developments on the basis of data from government sources, namely the CPCB, the Department of Economic Affairs (DEA) of the MoF, and the Planning Commission. As visible in Graph 5, in the first fifty years of India's independence, between 1947 and 1997, the amount of annually generated MSW in million tonnes increased by 700 per cent, from six million tonnes per year to 48 million tonnes. When looking at the past twenty years, the MSW quantity in India between 1997 and 2014 increased by around 30 per cent. The combination of economic liberalisation alongside continuous urbanisation plays a major role in this development. The official figures claim a rise of around 7 per cent in the decade before 2016, which seems to be a rather low estimate, especially when considering that all future projections depict a percentage increment between 60 and more than 80 per cent. Moreover, CPCB estimates an annual MSW amount of 300 million tonnes by 2047. If this projection materialises, it would result in an increment of a staggering 4,900 per cent within a hundred years after India's independence.

Graph 5: India's MSW generation in million tonnes per year and its (estimated) change between percentage 1947–2047



Sources: Data from CPCB (2014); CPCB (2015); CPCB (2016); MoF (2009); and Planning Commission (2014).

In order to show the existing variations in MSW generation estimations, a summary of past and present MSW generation figures from different sources is listed in the following:

- CPCB: The CPCB estimates an increment of solid waste generated in Indian cities from six million tons in 1947 to forty-eight million tons in 1997.[66] In the 2012 CPCB status report on MSW, this figure was 47 million tonnes per year for 2011–12. The Consolidated Annual Review Report on Implementation of Municipal Solid Wastes (Management and Handling) Rules, 2000 from 2013–14 gives a figure of 53 million tonnes per year, while the serial report from 2014–15 mentions an annual MSW generation of 51 million tonnes.[67] Also, the National Action Plan for Municipal Solid Waste Management which was published in 2016 refers to an annual MSW generation in India of 51 million tonnes. This would essentially mean that MSW generation in India has increased by only three million tonnes during the last twenty years, and further, MSW generation has decreased from 2014 to 2015.
- The Comptroller and Auditor General of India (CAG): The 2009 CAG's report on waste management states that India produces 49 million tonnes of MSW per year.[68]
- The Ministry of Finance (MoF): In the same year the CAG report was published, in 2009, the Department of Economic Affairs (DEA) of the Ministry of Finance published a Position Paper on The Solid Waste Management Sector in India, in which it states that India annually produces 58 million tonnes of MSW, almost ten million tonnes more than is mentioned in the CAG report.[69]
- Census 2011: As per the 2011 census, 62 million tonnes of MSW are being generated per year.[70]
- The World Bank: In 2012, the World Bank reported an annual 40 million tonnes of MSW in India.[71]
- The Planning Commission: The Planning Commission Committee chaired by K. Kasturirangan published the Report of the Task Force on Waste to Energy (WtE) (Volume II), in 2014, which states that India generates 62 million tonnes of MSW per year.[72]

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[66] Mane Ashish Vilas, "A Critical Overview of Legal Profile on Solid Waste Management in India", *International Journal of Research in Chemistry and environment* 5, no. 1 (2015): 2.
[67] Central Pollution Control Board, *Consolidated Annual Review Report on Implementation of Municipal Solid Wastes (Management and Handling) Rules, 2000*. (New Delhi: Ministry of Environment, Forests & Climate Change, 2015) 61; Central Pollution Control Board, *Consolidated Annual Review Report on Implementation of Municipal Solid Wastes (Management and Handling) Rules, 2000* (New Delhi: Ministry of Environment, Forests and Climate Change, 2014) 61.
[68] Comptroller and Auditor General of India, *The CAG Audit on Municipal Solid Waste in India* (New Delhi: Government of India, 2009) 11.
[69] Ministry of Finance, *Position Paper on the Solid Waste Management Sector in India*, 6.
[70] Planning Commission, *Report of the Taskforce on Waste to Energy 2014* (New Delhi: Government of India, 2014) i.
[71] Hoornweg and Bhada-Tata, *What a Waste: A Global Review of Solid Waste Management*, 81.
[72] Planning Commission, *Report of the Taskforce on Waste to Energy 2014*, 3.

- Toxics Link: In 2015, Toxics Link cites a figure of sixty-two million tons of MSW being generated annually by 377 million people in India's urban area, of which more than 80 per cent of the waste is being disposed of indiscriminately, causing health and environmental degradation.[73]
- Academia: Scholars from the field speak of MSW generation of 34 million tonnes in the year 2000, and 80 million tonnes in 2015.[74]

The existing data gap becomes further evident when looking at future predictions for India's MSW generation. Already official sources vary significantly when projecting future MSW figures for India: The Planning Commission estimates an annual MSW generation of 100 million tonnes by 2021, and 165 million tonnes annually by 2031. It is further projected that by 2050, annual MSW generation could reach 436 million tonnes.[75] While CPCB's outlook on India's MSW generation is 300 million tonnes per annum by 2047[76], The Department of Economic Affairs establishes an MSW generation outlook of 260 million tonnes[77] for the same year. The variation between these three official sources is immense, with a projection difference of more than 170 million tonnes in a time span of three years. Also, for the near future, the figures vary drastically with the Planning Commission's projection of 100 million tonnes annually by 2021, and the World Bank's projection of almost 40 million tonnes more in 2025.[78] Scholars' projections for future MSW generation in India also vary significantly. While some expect 200 million tonnes of MSW by 2030,[79] others estimate urban India to generate 160.5 million tonnes by 2041.[80]

2.1.3. Delhi's MSW Composition

Delhi's MSW composition mirrors the developments which occur at the country level. Various organisations and institutions have conducted studies in the past to analyse the composition of MSW in the capital. Therefore, while MSW data exists, it is often inconsistent or

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[73] Raveesh Agarwal, Mona Chaudhary, and Jayveer Singh, "Waste Management Initiatives in India for Human Well Being", *European Scientific Journal, ESJ* 11, no. 10 (2015).
[74] Rajendra Kumar Kaushal, George K Varghese, and Mayuri Chabukdhara, "Municipal Solid Waste Management in India-Current State and Future Challenges: A Review", *International Journal of Engineering Science and Technology* 4, no. 4 (2012); Biplob Nandy, Gaurav Sharma, Saryu Garg et al., "Recovery of Consumer Waste in India–a Mass Flow Analysis for Paper, Plastic and Glass and the Contribution of Households and the Informal Sector", *Resources, Conservation and Recycling* 101 (2015).
[75] Joshi and Ahmed, "Status and Challenges of Municipal Solid Waste Management in India: A Review", 4; Planning Commission, *Report of the Taskforce on Waste to Energy 2014*, 3.
[76] Vilas, "A Critical Overview of Legal Profile on Solid Waste Management in India".
[77] Ministry of Finance, *Position Paper on the Solid Waste Management Sector in India*, 7.
[78] Hoornweg and Bhada-Tata, *What a Waste: A Global Review of Solid Waste Management*, 81.
[79] Kaushal, Varghese, and Chabukdhara, "Municipal Solid Waste Management in India-Current State and Future Challenges: A Review"; Nandy, Sharma, Garg et al., "Recovery of Consumer Waste in India–a Mass Flow Analysis for Paper, Plastic and Glass and the Contribution of Households and the Informal Sector".
[80] Ranjith Kharvel Annepu, "Sustainable Solid Waste Management in India" (Columbia University in the City of New York, 2012), executive summary.

contradictory when compared.[81] When looking at the development of the three main fractions of MSW, namely biodegradables, recyclables and inert, between 1982 and 2010, as depicted in Graph 6, one can identify certain changes which are by now characteristic of the fraction materials and as well as the Indian urban waste context. The fraction of organic waste was almost 60 per cent in 1982, while in 1995 the share had decreased to less than 40 per cent, and again rose to above 50 per cent. This proportion of biodegradable waste has since remained. The developments in the inert section need to be considered against the backdrop of the earlier mentioned scenario, in which C&D waste until 2016 by default was the responsibility of Delhi's ULBs. Due to the continuous construction activities in the city, the inert material, which then included C&D waste, increased by almost 42 per cent, from 34 to 49 per cent, between 1982 and 2002. By 2005, inert covered around 30 per cent of the overall MSW composition. In 2016, this remains the estimated inert percentage of Delhi's MSW.

Delhi's MSW composition in the past years has transformed, especially in regard to recyclables, and here, especially in regard to plastic. In the segment of recyclables, the share of plastic has increased immensely during the years: while the share of plastic was 1.5 per cent in 1982, it had already increased to 6 per cent in 2002, and 10 per cent in 2010. Economic growth, increasing incomes and changing consumption patterns lead to the market being flooded by packaging material. In addition to this, as mentioned earlier, high-income areas usually have a high amount of generated plastic and paper, two materials which have been steadily increasing over the past three decades in Delhi.[82] Overall, from 1982 to 1995, the share of recyclables in Delhi's MSW composition increased by more than 55 per cent. Between 1982 and 2010, this value increased by more than 116 per cent. Considering this hike in recyclables, one can estimate that the future percentage share for Delhi will increasingly resemble the distribution of material in an urban area of a high-income country.[83] An outlook which underlines once again the urgent need for an effective MSWM system, in which recycling and reuse need to be two core elements.

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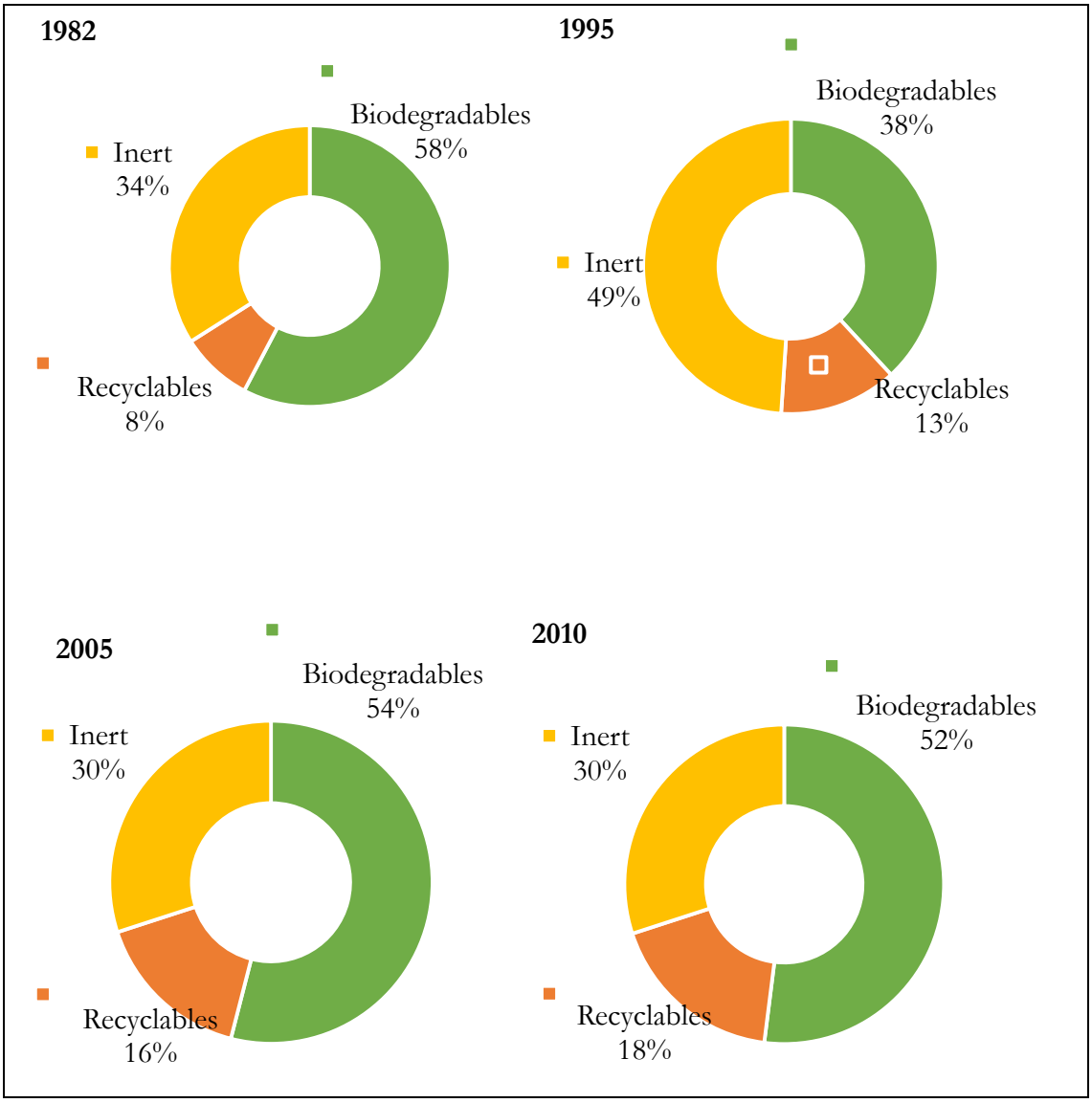
[81] Hoornweg and Bhada-Tata, *What a Waste: A Global Review of Solid Waste Management*; UN-Habitat, *Solid Waste Management in the World's Cities*; Institute of Hygiene and Public Health (IHPH), *Studies of Institute of Hygiene and Public Health* (Calcutta: Institute of Hygiene and Public Health (IHPH), 1982); National Environmental Engineering Research Institute, *Solid Waste Management in MCD Area* (Nagpur, India: Government of India, 1995); Tata Energy Research Institute, *Performance Measurements of Pilot Cities* (New Delhi, India2002).

[82] Vikash Talyan, RP Dahiya, and TR Sreekrishnan, "State of Municipal Solid Waste Management in Delhi, the Capital of India", *Waste Management* 28, no. 7 (2008): 1280.

[83] As a comparison, in 2016 in Germany, the share of organic material in MSW composition was around 22 per cent, while the recyclable share was more than 50 per cent, and the inert material, like in India, amounted to around 30 per cent. Umweltbundesamt, "Zusammensetzung Der Haushaltstypischen Siedlungsabfälle 2016", Umweltbundesamt, https://www.umweltbundesamt.de/daten/ressourcen-abfall/abfallaufkommen#textpart-8 (last accessed April 11, 2019).

Graph 6: Percentage composition of Delhi's MSW in 1982, 1995, 2005 and 2010



Sources: Data from Hoornweg and Bhada-Tata (2012), 78; IHPH (1982); NEERI (1995); and UN-Habitat (2010), 12.

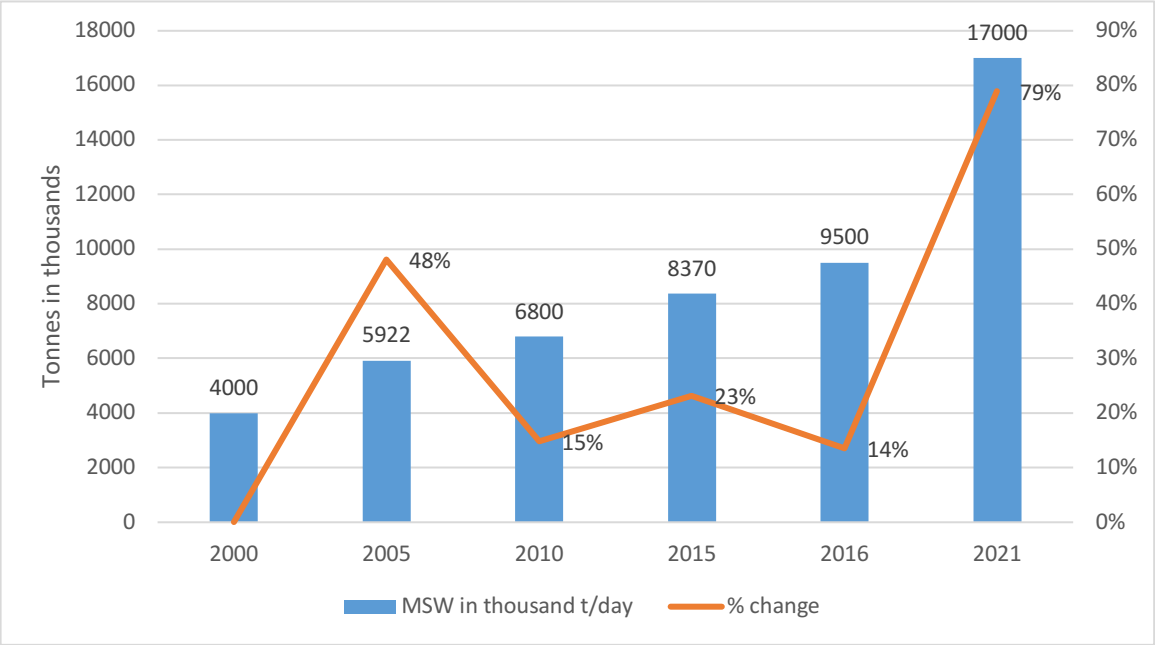
2.1.4. Delhi's Waste Generation

"Solid waste data in many cities is largely unreliable and seldom captures informal activities or system losses."[84] Also, the figures of MSW generated in Delhi vary from source to source: according to a World Bank research, Delhi as a whole already generated approximately 6,000 tonnes per day (TPD) in 2005, and 10,000 tonnes solid waste from households every day in the year 2012.[85] The Delhi Pollution Control Committee, on the other hand, gave a quantum of seven thousand MSW TPD on their website in 2016.[86] Graph 7 depicts the developments

[84] UN-Habitat, *Solid Waste Management in the World's Cities*, 11.
[85] Hoornweg and Bhada-Tata, *What a Waste: A Global Review of Solid Waste Management*, 61.
[86] Delhi Pollution Control Committee (DPCC), "Municipal Solid Waste Management in Delhi", Delhi Pollution Control Committee (DPCC), http://dpcc.delhigovt.nic.in/waste-msw.html (last accessed April 10, 2019).

of Delhi's MSW generation in thousand TPD, and includes the percentage rise every five years. As highlighted in Graph 7, Delhi generated 4,000 tonnes MSW in a day in 2000, and around 6,000 tonnes in 2005, which results in an almost 50 per cent rise within five years. In 2011, the generated MSW amounted to 6,800 TPD, which resulted in an increment of around 15 per cent compared to five years earlier.[87] In their annual review report on MSW from 2015, CPCB estimated a figure of 8,370 TPD, a percentage rise of 23 per cent in comparison to 2010.[88] While the current figures vary somewhat significantly, the trend of a gradually increasing amount of MSW is clearly noticeable from Graph 7.

Graph 7: Delhi's MSW generation in thousand tonnes per day and its estimated percentage change between 2000–2021



Sources: Data from CPCB (2013) and Talyan (2008).

The figures for total MSW generation in Delhi in the future project a gloomy picture. It is being estimated that due to increasing urbanisation and continuous in-migration and immigration into the city, MSW generation is likely to increase to 17,000 to 25,000 TPD by 2021.[89] Even if the lower end of this spectrum, namely seventeen thousand MSW TPD, is

[87] Central Pollution Control Board, *Status Report on Municipal Solid Waste Management* (New Delhi: Ministry of Environment & Forests, 2013) Annexure A.
[88] Central Pollution Control Board, *Consolidated Annual Review Report on Implementation of Municipal Solid Wastes (Management and Handling) Rules, 2000*; Central Pollution Control Board, *The National Action Plan for Municipal Solid Waste Management* (New Delhi: Ministry for Environment & Forest, Government of India, 2016).
[89] Talyan, Dahiya, and Sreekrishnan, "State of Municipal Solid Waste Management in Delhi, the Capital of India"; New Delhi IL&FS Ecosmart Limited, *City Development Plan Delhi* (New Delhi: Government of Delhi Department of Urban Development, 2006); Hoornweg and Bhada-Tata, *What a Waste: A Global Review of Solid Waste Management*, 61; Chintan, *Space for Waste Planning for the Informal Recycling Sector* (New Delhi: Chintan Environmental Research and Action Group, 2003) 2.

considered, Delhi would face an almost 80 per cent hike within five years, which would put even further pressure on the already strained system and the involved stakeholders.

2.2. Delhi's MSWM System—An Overview

Municipal solid waste management at its core comprises different elements: segregation, storage, primary and secondary collection, transportation, processing, treatment and disposal. The challenges related to increased MSW generation and its management are especially acute in most urban areas since the collection, processing and disposal systems are usually inadequate to handle this scale. The factor of "[u]rbanisation directly contributes to waste generation, and unscientific waste handling causes health hazards and urban environment degradation."[90] In India's urban areas, this is resulting in widespread open dumping and burning, with 70 to 90 per cent of MSW disposal sites in India being open dumping grounds with insufficient or no cover soil provided.[91] This is causing pollution and nuisance to the environment, and consequently to the people, and more than 91 per cent of MSW collected is still being landfilled or dumped on open lands and dumps.[92] "Effective waste management is expensive, often comprising 20–50 (…) [percent] of municipal budgets."[93] Usually funds for SWM in India are part of an annual municipal general budget. The services which are to be provided by the municipalities in the frame of the given budget increase with the size of the respective city. In India, ULBs spend around 10 to 70 per cent of their total budget on waste management services. Municipalities in smaller cities, in which MSWM is one of the main municipal services, spend up to 70 per cent of their total budget on MSWM. In larger cities, in which municipalities need to provide a larger scale of services related to sanitation, sewerage or water supply, only 10 per cent of the available municipal budget is being spent on MSWM.[94] With no specified municipal solid waste management fee in place,

> [t]he present solid waste cleansing tax is charged as a percentage of property tax. It is observed that this proportion cannot be raised further due to legal restrictions. The revision of property tax is also carried out only infrequently. It is hence desirable to provide

[90] Danny Mulala Simatele, Smangele Dlamini, and Nzalalemba Serge Kubanza, "From Informality to Formality: Perspectives on the Challenges of Integrating Solid Waste Management into the Urban Development and Planning Policy in Johannesburg, South Africa", *Habitat International* 63 (2017): 123.
[91] Vilas, "A Critical Overview of Legal Profile on Solid Waste Management in India", 8.
[92] Annepu, "Sustainable Solid Waste Management in India", 54.
[93] The World Bank, "Solid Waste Management", The World Bank, http://www.worldbank.org/en/topic/urbandevelopment/brief/solid-waste-management (last accessed April 8, 2019).
[94] Da Zhu, P. U. Asnani, Christian Zurbrugg et al., *Improving Municipal Solid Waste Management in India: A Sourcebook for Policy Makers and Practitioners*, Wbi Development Studies (The World Bank, 2008); David Hanrahan, Sanjay Srivastava, and A Sita Ramakrishna, *Improving Management of Municipal Solid Waste in India: Overview and Challenges* (New Delhi: The World Bank, 2006); Ministry of Urban Development, *Advisory on Improving Municipal Solid Waste Management Services* (New Delhi: Government of India, 2013) 23; Ankit Kumar Chatri and Arslan Aziz, *Public Private Partnerships in Solid Waste Management. Potential and Strategies* (Athena Infonomics India Pvt. Ltd., 2012) 43.

> for levying of an additional dedicated tariff for solid waste services. It should be based on the frequency of service, volume/weight of the waste or combination of both or on family basis.[95]
>
> Municipal authorities levy taxes, charges, and fees such as property tax, water tax, parking fee, levies on advertisement hoardings, etc. to generate revenues and to improve their financial situation (…). In reality though, municipal authorities suffer a major deficit of funds to meet their obligations, with some not even being able to pay their staff members' salaries (…).[96]

Among policy makers and scholars exists a common understanding that "[t]here is an urgent need for much improved medium-term planning at the municipal and state level so that realistic investment projections can be developed and implemented."[97]

> (…) there is limited cost recovery through collection charges because they are not considered politically feasible. The budget, overly reliant on property taxes, needs to be supported by subsidies from the state and central government to meet the costs of solid waste management. Further, the municipal budgets do not have a clear estimation of the overall costs of solid waste management in the city. Most noticeably, the costs associated with capacity development of staff as well as operation and maintenance of infrastructure are overlooked.[98]

Moreover:

> Matters are made worse because municipal accounts are a mess. Most urban local bodies do not even maintain annual accounts. This lack of finances for basic municipal services is compounded by the fact that citizens do pay for waste management—but not to the municipal body. In most cities, residents, particularly the affluent waste-generating ones, have engaged private agencies to undertake door-to-door collection. The household pays for this service. But the agency then takes the waste and invariably dumps it in the municipal secondary collection station. The transportation and processing of the waste is then left to the already depleted finances of the local body.[99]

According to a representative of a Delhi-based environment think tank, Delhi's MSW budget distribution splits into 80 per cent expenditure for employees, 15 per cent budget expenditure for transport, and only 2 per cent of the overall MSW budget is being spent on waste treatment.[100] This budget distribution already gives a glimpse of the situation in Delhi, where the city faces its own sets of challenges and hurdles in relation to each of the different MSWM elements, as the focus is still mainly on collection and disposal. Moreover "(…) limited

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[95] Ministry of Urban Development, *Advisory on Improving Municipal Solid Waste Management Services*, 23.
[96] Arora, Paterok, Banerjee et al., "Potential and Relevance of Urban Mining in the Context of Sustainable Cities", 5.
[97] Hanrahan, Srivastava, and Ramakrishna, *Improving Management of Municipal Solid Waste in India: Overview and Challenges*.
[98] Chaturvedi, Vijayalakshmi, and Nijhawan, *Scenarios of Waste and Resource Management: For Cities in India and Elsewhere*, 15.
[99] Sunita Narain, "Garbage Is About Recycling", *Down to Earth*, June 8, 2016, http://www.downtoearth.org.in/blog/garbage-is-about-recycling-54116 (last accessed April 10, 2019).
[100] Irene Salenson, "Waste Recycling Systems in Emerging Cities", in *Valuing Waste or Wasting value? Rethinking waste processing in fast growing middle-income cities* (New Delhi: The CPR Scaling City Institutions for Sanitation programme and Agence Française de Développement, 2018).

capacities have led municipal authorities to make do with a minimal waste management service, limiting their efforts to reduce the sanitary risks in the city, by prioritizing waste collection and evacuation."[101]

2.2.1. Delhi's MSW Economy

Effective solid waste management is a complex challenge and it depends on an even more complex actor landscape. With every hundredth person[102] in Delhi being in one way or the other engaged in the waste sector, the actor landscape of Delhi's SWM economy is as diverse as it is dynamic and is shaped by various public and private actors and the interactions, alliances and conflicts among those actors. The complexity of the landscape is increased by the diverse actors' objectives and priorities, various technologies, and manifold and divergent management approaches. The case of Delhi is especially challenging as the city has been at the forefront of the policy shift towards privatisation and its actor landscape is therefore mirroring the developments of recent years. Urban local bodies, civil society and the private sector (formal and informal) are involved in driving a variety of approaches to find sustainable working solutions for Delhi's SWM challenge.

Five local governments, the New Delhi Municipal Council (NDMC), the Delhi Cantonment Board (DCB), the North Delhi Municipal Corporation, the South Delhi Municipal Corporation (SDMC) and the East Delhi Municipal Corporation (EDMC), comprising 280 municipal wards, are responsible for more than 9,500 MSW TPD which is being generated by the city. As mentioned earlier, the actual figure of generated waste could be much higher, as the involvement of the informal workers at many stages of the waste management chain makes tracking difficult.[103] While the ULBs are responsible for the cleanliness of Delhi, their lack of finances, skills and knowledge lead to a situation in which the local government is badly equipped to face the existing challenges. These limitations of the public sector gave way in the first place to the shift to privatisation, not considering the role of informal waste workers.

This policy shift disregarded the fact that traditionally, waste management provides income opportunities for the urban poor: in India, as in most low- and middle-income countries, waste management provides jobs for 1–2 per cent of the population, mostly urban poor, and evidence suggests that the informal economy supports the local government in

[101] de Bercegol, Cavé, and Nguyen Thai Huyen, "Informal Recycling Vs Municipal Waste Service in Asian Cities: Opposition or Integration to Municipal Service?", 10.
[102] NGO representative, New Delhi, February 2017.
[103] Singh, "No More N-I-M-B-Y"; Swati Singh Sambyal, "Delhi's Solid Waste: As Systemic Failure", *Down to Earth* January 13, 2017, http://www.downtoearth.org.in/blog/delhi-s-solid-waste-a-systemic-failure-56776 (last accessed April 11, 2019).

waste management in the entire waste management value chain—from collection, segregation and transportation, to repair, reuse and recycling—while at the same time saving substantial amounts of natural resources through efficient recycling. Also in Delhi, the urban poor form the backbone of recycling programmes as informal waste workers. Approximately 150,000 to 200,000 waste workers of the informal economy provide essential work to the city of Delhi as they form the very base of waste collection and segregation, while their services are being provided mostly at no cost to the government, the authorities or the residents. Moreover, as outlined in Box 4, Box 8, Box 9 and Box 11, waste workers face occupational hazards and police harassment, as this workforce is socially stigmatised. It is being estimated that informal waste workers divert over 25 per cent of all waste generated in Delhi from disposal into recycling of materials, thus saving very substantial funds for the municipal authorities.[104] Waste workers on average save 20 per cent of MSWM costs for the municipalities.[105] They upgrade the materials and sell them into the recycling supply chain, a pyramid going from pickers to the *kabariwallahs* (the small-junk dealers), on the boundaries of formal and informal recycling. The *kabariwallahs* sell to specialised dealers and end-users, and some material is also exported.[106]

Box 4: India's waste culture—Examples from Delhi

When analysing Delhi's MSW economy, it is crucial to consider the cultural aspects surrounding the overall topic of MSW: MSW is still considered something 'dirty,' and the main focus of residents as well as the public sector is on the removal of the MSW from the field of vision. What happens after someone has thrown something away is commonly not known and often not of interest. While behaviour and habits in the field of waste management are an active area for applied research[107], in this research at hand, the contextualisation of certain habits and behaviours in regard to MSW and the people who work with waste and the consequent implications, derive from the interviews conducted with community representatives.

> Chand: I know that in other countries they do it differently. I have seen it in Europe. Here, I don't know, the system is very bad. The *kudhawallah* [a person working with waste] comes almost daily, sometimes he doesn't turn up. Then we don't know when our bins will be emptied. For us it is a big problem. What are we supposed to do then? It's good, when he comes every day, then we don't need to sit on our waste. (…) I think he goes and sells some of it, rest he dumps it at the *dhalao* [local dumping site] close to

[104] UN-Habitat, *Solid Waste Management in the World's Cities*, 2.
[105] Ibid., xxii; Salenson, "Waste Recycling Systems in Emerging Cities".
[106] UN-Habitat, *Solid Waste Management in the World's Cities*, 59.
[107] V Sharp, "Emerging Evidence from Waste Prevention and Behaviour Change Research" (paper presented at the Changing the Face of Waste Management, Proceedings of the CIWM Conference, Paignton, UK, 2006); ibid.

the *masjid* [mosque]. I only care that he picks it up, after this it's out of my control. (Chand, fifty-eight, South Extension II, May 5, 2017)

Chitra: I only see him [the waste picker] coming with this large bag, in which he puts all the waste. I think he collects as much as he can and then he goes somewhere else with it. But I don't know, I never speak to him. (…) It is so dirty downstairs, maybe he dumps it downstairs. I am just happy when it's not in my flat. In this climate, you cannot keep it very long, then it starts to smell, you know? (Chitra, sixty-one, South Extension II, May 5, 2017)

MSW is rarely seen as a good or as a source, which is partly recyclable and therefore useful. The informal waste workers who substantially contribute to a circularity of the existing waste flow are far too little, if at all, appreciated. In fact, more often than not, the work with waste is viewed with aversion and the people who work with waste as at least dubious. The relation between the residents and the people engaged in the informal waste economy is shaped by ignorance and often the waste workers are either not, or only negatively, noticed by the surrounding society. Every day, the waste workers "(…) fight for the right to live as an acknowledged, useful part of the urban ecosystem."[108]

Siya: In this block people use the *kudhawallahs* as their personal punching bag. It's horrific. Every morning I hear the downstairs and upstairs neighbours shout at the guy who comes and picks up the waste. It is as if they let out all frustration on that poor fellow. Often, they argue about money. Come on, this is Defence Colony! When you live here you can afford to spend fifty, hundred, two hundred Rupees a month, it doesn't hurt you. But when it comes to waste, then people go crazy. If the waste guy hasn't come twice in that month, they deduct money and shout for twenty rupees. (Siya, thirty-seven, Defence Colony, July 12, 2017)

Arjun: We are six people. For us it is very upsetting if the *kudhawallah* doesn't come. We pay him, and he should come on a daily basis. For them [the waste worker] it's also good. They even get paid to then sell it further. We pay fifty Rupees a month, can you imagine? He works in the whole colony and even in South Ex, I think. I know he sells a lot, so he earns good money. (Arjun, thirty-five, Uday Park, June 2, 2017)

Raghav: I feel bad for him [the waste collector], and I would like to do something about his situation. Once, he did not turn up for a whole week. He had some troubles, I think he was sick, maybe also something with the area here, I am not sure. The guy who came before at one point never turned up again. It's not clear for me how this system works. When I ask, I feel as if they don't want to talk about it. So, what should I do? I let it be. (Raghav, forty-four, New Friends Colony, July 5, 2017)

Sikander: It really depends, sometimes people have a bad day and shout. They often don't understand my situation. I come from far, with the cycle it takes 2 hours. Sometimes I cannot come. Then the next day the people shout and get angry because I was not there the day before. (Waste Worker (WW), Sikander, twenty-four, Masjid Moth, April 21, 2017)

Uma: It is difficult. This work is not good. I have two children, I need the money. People can be very bad. Sometimes they don't pay or give me less. Then I still need to go there because I don't have a choice. What should I do? I need to earn. My husband

[108] Chaturvedi, *Finding Delhi: Loss and Renewal in the Megacity*, xi.

also collects waste. Maybe one day we can have our own *godam* [storage space for recyclables] that would make things easier for us. (WW, Uma, twenty-four, South Extension II, July 7, 2017)

The level of awareness when it comes to the importance and the necessity of waste collection and recycling along with a form of helplessness and ignorance, or lack of knowledge among the waste generators create a challenging situation. As long as waste is seen as useless and the work with waste viewed with aversion, it hinders a certain level of professionalism which also spills into the related work systems and institutions.

Source: Author's own.

The conflicting dynamics among Delhi's private sector actors and the public sector paved the way for a number of environmental NGOs to step in and create awareness in regard to the environmental damages the ill-managed solid waste management system in Delhi is leading to. Moreover, numerous NGOs address social justice concerns of the waste workers in an integrated manner, and advocate rights and organise the activities of these informal waste workers. Delhi's MSWM actor landscape builds the frame and ground for the difficulties which are associated with sustainable solid waste management for the city. The existing combination of lack of understanding of waste flows and quantities, lack of recognition and lack of acknowledgement of the informal waste economy, lack of accountability and failure of political participatory decision-making processes, create the need to better understand the dynamics and power relations between the involved stakeholders—an issue which will be further addressed in Chapter 5 of this research.

2.2.2. Delhi's MSW Flow

The flows and management of MSW in Delhi are very complex, with a variety of stakeholders involved at different stages. The official understanding is, as depicted in Figure 2, quite simplistic, with waste being generated at source, collected through primary (e.g. door-to-door collection (DTDC)) and secondary systems (municipal collection at dumpsite), and transported to waste treatment facilities or disposal sites. However, Delhi's waste management is far more complex than the "official" recognition of the system, as the informal waste management system works alongside the formal waste management system at almost every stage of the waste management chain, as highlighted with red arrows in Figure 2: from primary collection, to the transportation of MSW, to the segregation of MSW at the colony dumpsites or landfills, to dealing with specific material and feeding it back into the system—the activities carried out by Delhi's waste workers are manifold and run often parallel to the formal waste management system. The waste workers face multiple hurdles and challenges at each

of these stages. The first stage of the waste management chain is the household or commercial establishment level, as this is the source of MSW: in 2016, source segregation[109] became a mandatory element of the Solid Waste Management Rules, 2016, which remains a significant challenge, as "(…) it is mostly not carried out effectively or at all."[110] Interviews with waste generators reveal that the spectrum of practice and the application of source segregation methods is broad. Waste generators often question the practice of source segregation, or at least feel challenged by separating their household waste at home. As outlined in Box 5, they raise a variety of reasons for this. Only few interviewees express some understanding of the need for source segregation and ideas for how to implement this practice in the future.

Box 5: Waste generators in Delhi on source segregation

Chitra: We do not segregate waste at home due to insufficient space for the needed bins. (Chitra, sixty-one, South Extension II, May 5, 2017)

Chand: The municipality should provide the adequate infrastructure and equipment, like coloured plastic bags otherwise segregation becomes very difficult. (Chand, fifty-eight, South Extension II, May 5, 2017)

Ritu: When I segregate waste, the waste picker who comes and picks it up, puts it all back together in one bag. So why should I segregate it in the first place? (Ritu, fifty-three, Friends Colony West, June 3, 2017)

Sudeepa: There needs to be a general shift in how we deal with our waste. I don't understand why people use plastic bags for their organic waste. For me this is a contradiction. Either put a newspaper bin lining or directly compost at home. Composting in homes, societies or RWAs should be a norm. (Sudeepa, thirty-one, Savitri Nagar, March 15, 2017)

Anuraag: We separate our waste at home. It could be better, I guess. We distinguish between plastic, organic and paper. Batteries and glass, we also dispose separately. For us it was important to do this, so that our daughter learns this very early on. Only when it is part of your upbringing than something like this can become a habit. (Anuraag, forty-five, Kailash Hills, November 4, 2016)

Nidhi: I would like to learn more about waste and segregation in school. But in my school, they do not teach anything about this. I will ask my teacher why they don't teach about this. (Nidhi, thirteen, Janakpuri, February 11, 2017)

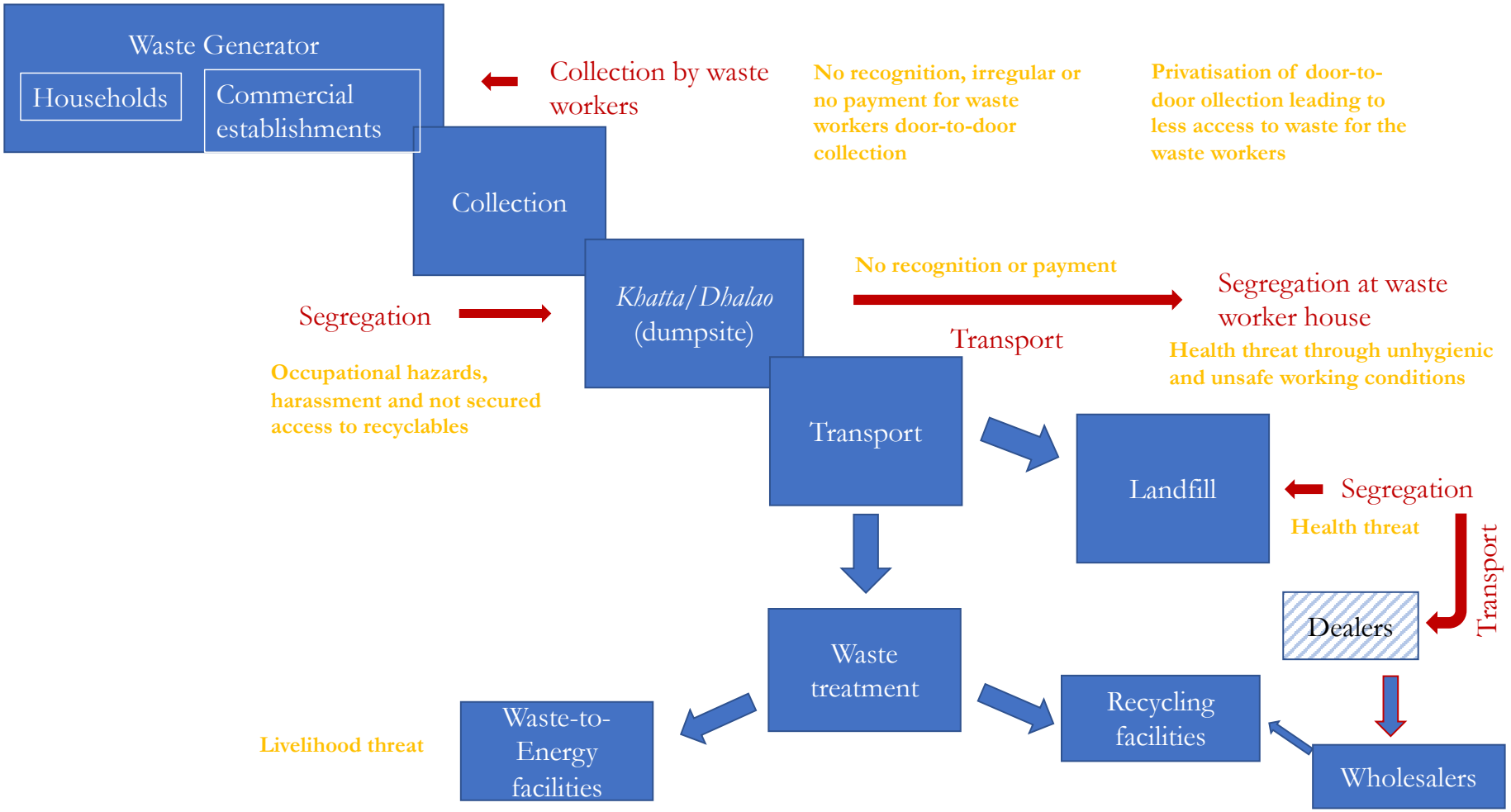
Komal: I don't see the point to be honest. Why should we segregate. It will all end up in one bag as it is anyway. The waste guy does not have three bags, he comes with one. We tried segregating but seeing how it is all dumped together as soon as it leaves our home, we stopped it. (Komal, thirty, Dwarka, November 4, 2016)

Source: Author's own.

[109] The Solid Waste Management Rules, 2016, define segregation as "(…) sorting and separate storage of various components of solid waste namely biodegradable wastes including agriculture and dairy waste, non biodegradable wastes including recyclable waste, non-recyclable combustible waste, sanitary waste and non recyclable inert waste, domestic hazardous wastes, and construction and demolition wastes (…)." Ministry of Environment, "Solid Waste Management Rules, 2016", 3.44.

[110] NGO representative, New Delhi, February 11, 2017.

Figure 2: Delhi's MSW economy



Source: Based on Agarwal, Marshall, Pandey, and Randhawa (2015), 4.

Proper source segregation would significantly reduce the burden on all actors involved at that stage: While it would reduce the burden on solid waste management agencies, it would at the same time increase the options of scientific disposal or treatment.[111] Moreover, source segregation would ease the job of waste workers. Segregation of waste is mostly accomplished by informal workers and usually takes place under unsafe and often hazardous conditions for the workers and the environment in which the segregation is being carried out.

> Kanta: It is very, very smelly and we often fall sick. Can you imagine going everyday through all sorts of waste with your bare hands? Often there is broken glass mixed in it, or razors. The smell is unbearable. If the people who produce the waste do not want to touch their own waste, how can they accept other people doing that. Often, we do not get paid by people where we pick up the waste, even if it is only 50 Rupees per month. (WW, Kanta, forty-seven, Malviya Nagar, June 1, 2017)

Since the main priority of informal waste workers is the segregation of valuables, the focus and therefore the effectiveness of waste workers is limited to recoverable material, often leaving out fractions of value for which certain technologies are required and leaving behind material which is of no value to the waste worker.

Delhi's primary MSW collection systems—the informal door-to-door collection as well as the formal door-to-door collection—vividly depict the complementation, overlap or sometimes parallelism of the formal and informal system: despite private companies having primary collection contracts, more than 50 per cent of the primary collection in Delhi is still done by waste workers of the informal economy, for which they often do not get paid.[112] The authors of the UN-Habitat report on Solid Waste Management in the World's Cities even suggests that

> [t]he process flow for Delhi, India, suggests quite clearly that the only waste that is being collected is moving through the informal sector. Everything else is either thrown onto streets, where it is captured by sweepers, is taken to containers or is discharged in the park. In this example, a world-class city depends upon its waste-pickers for keeping a basic level of cleanliness.[113]

The collection efficiency therefore very much depends on the collaboration of formal and informal sector workers; India has an average collection efficiency of MSW in its cities and states of about 72 per cent, and in Delhi about 60 to 70 per cent,[114] which "(…) creates the

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[111] Joshi and Ahmed, "Status and Challenges of Municipal Solid Waste Management in India: A Review", 2; Gupta and Arora, "A Study on Management of Municipal Solid Waste in Delhi", 138.
[112] Ravi Agarwal, Fiona Marshall, Poonam Pandey et al., *Rethinking Urban Waste Management in India* (STEPS Centre, 2015).
[113] UN-Habitat, *Solid Waste Management in the World's Cities*, 35.
[114] NGO representative, New Delhi, February 11, 2017; Kaushal, Varghese, and Chabukdhara, "Municipal Solid Waste Management in India-Current State and Future Challenges: A Review", 1481.

ideal working conditions for a parallel shadow economy to operate."[115] "There are many areas in which, either owing to space or manpower constraints, the formal private sector mechanisms for waste collection and segregation do not work and are entirely dependent on the informal sector."[116] In regard to the primary collection system, it is important to note that the dominant method of uncontrolled dumping of MSW remains one of the main challenges in Delhi. The uncollected solid waste clogs drains and causes flooding, which eventually leads to the spread of waterborne and vector-borne diseases, such as typhoid, dengue fever and chikungunya.[117] The health consequences of this are as much relevant for the inhabitants of Delhi's squatter settlements, slums and illegal colonies, which comprise almost 50 per cent[118] of Delhi's population and do not reveal any of the official MSW services, as it is for the inhabitants of the areas which do reveal official MSW services. Therefore "[t]he modernization challenge (…) includes how to extend collection coverage to unserved parts of the city where there is less infrastructure and the ability to pay is lower. (…) But without providing comprehensive collection, these cities are not fulfilling their responsibility to protect public health (…)."[119]

Delhi's municipalities provide various types of secondary storage facilities and collection points, called *dhalaos* (local dumping site) or *khattas* (local dumping site). These dumpsites or transfer stations, which are generally open or partly covered with wire mesh, are located throughout the city's colonies and are the responsibility of the municipalities as they are the basis for secondary collection and transport to disposal or treatment facilities. However, the transfer station is also another space where the work of formal and informal workers overlaps, as waste workers segregate recyclables on the spot at the *dhalaos* or transport waste to their house for further segregation. During their activities at the *dhalaos*, the waste workers often face occupational hazards or police harassment, aspects which will be addressed in more detail in the course of this research. The waste workers segregate the waste and then sell it to small scale junk dealers. The junk dealers then sell it to wholesalers, who in turn sell the recyclable material in large quantities to formal and informal recycling firms.[120] When collected by the municipality or a formal waste management company, the waste is

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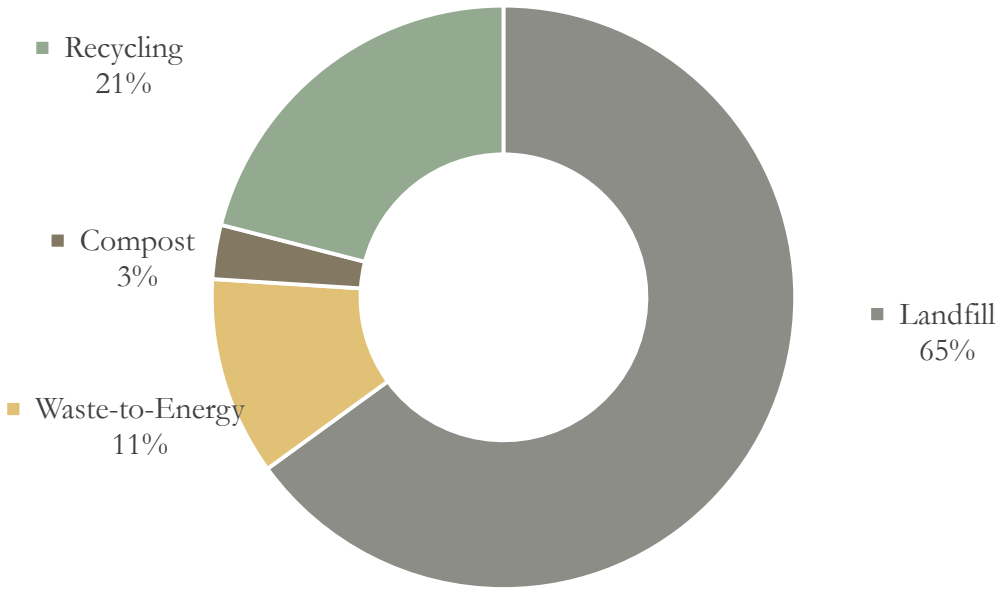
115 Kabadiwallaconnect, "Historical Perspectives on the Informal Waste Sector", Kabadiwallaconnect, https://www.kabadiwallaconnect.in (last accessed April 10, 2019).
116 Agarwal, Marshall, Pandey et al., *Rethinking Urban Waste Management in India*, 5.
117 UN-Habitat, *Solid Waste Management in the World's Cities*, 22.
118 Ibid., 59.
119 Ibid., 22.
120 Agarwal, Singhmar, Kulshrestha et al., "Municipal Solid Waste Recycling and Associated Markets in Delhi, India"; Gidwani and Reddy, "The Afterlives of "Waste": Notes from India for a Minor History of Capitalist Surplus"; Hayami, Dikshit, and Mishra, "Waste Pickers and Collectors in Delhi: Poverty and Environment in an Urban Informal Sector".

transported from the *dhalao*, in either bullock carts, hand rickshaws, compactors, trucks, tractors, trailers or dumpers, to waste treatment facilities or disposal sites, such as landfills.[121]

By 2016, the four dominant treatment methods practiced in Delhi are disposal, recycling, waste-to-energy and composting. As depicted in Graph 8, at 65 per cent, landfilling remains the most frequented management practice for MSW in Delhi. While landfilling is one of the oldest forms of waste treatment, it is also the least desirable option because of the many adverse impacts it can have on the environment and people.

Graph 8: Percentage composition of Delhi's MSW treatment methods between 2015–2016



Source: Salenson (2018).

It is estimated that about 8,000 TPD of the collected waste end up at one of Delhi's landfill sites.[122] Since 2016, Delhi relies on three landfill sites at Bhalswa (North Delhi Municipal Corporation), Okhla (SDMC) and Ghazipur (EDMC). All three landfills are overloaded with mountains of waste shaping the cityscape in those areas.[123]

> (…) the three landfill sites are not designed as per specifications mentioned in the Solid Waste Management Rules, 2016. According to the Master Plan for Delhi, 2021, these

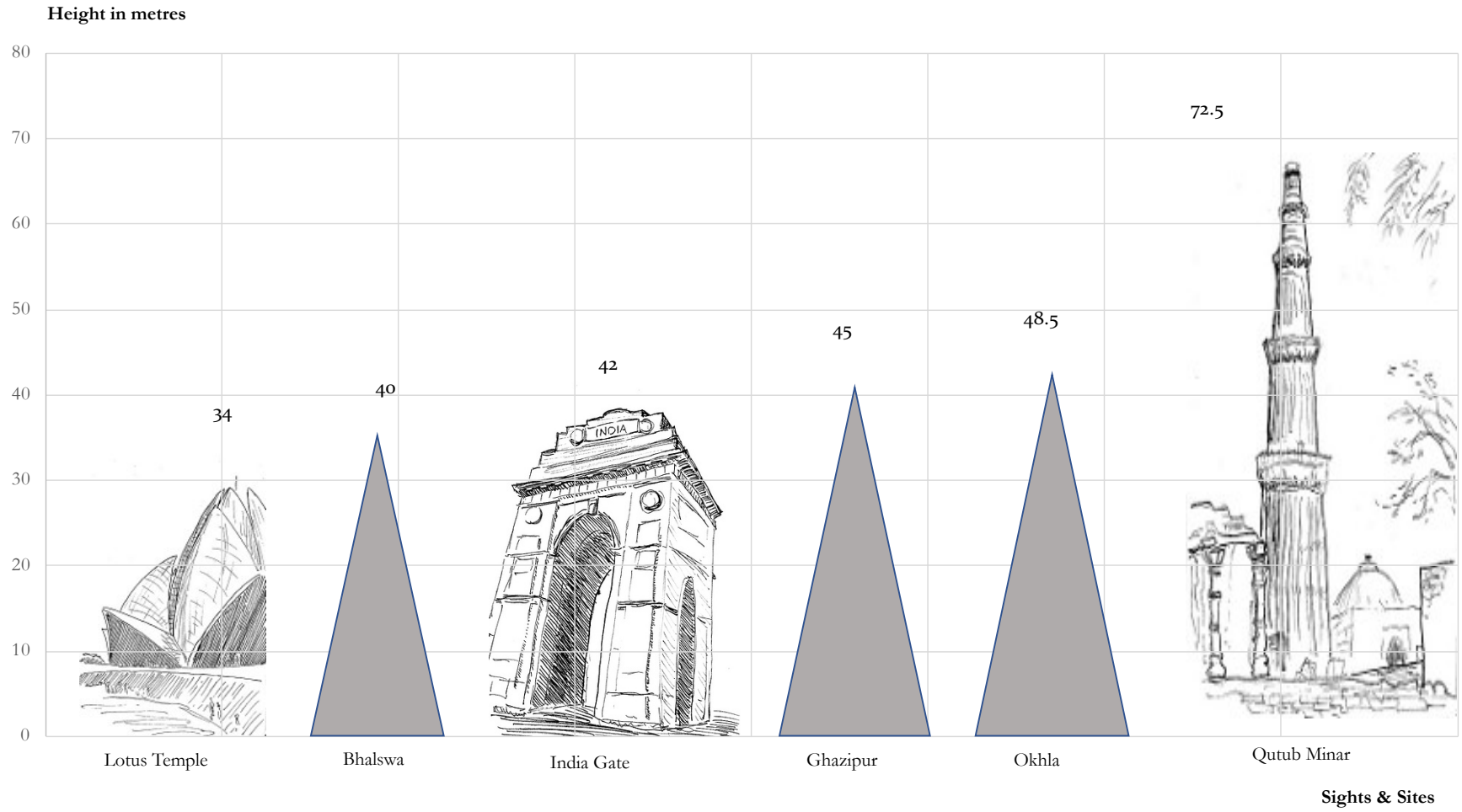
[121] Joshi and Ahmed, "Status and Challenges of Municipal Solid Waste Management in India: A Review", 6; Gupta and Arora, "A Study on Management of Municipal Solid Waste in Delhi", 135; Talyan, Dahiya, and Sreekrishnan, "State of Municipal Solid Waste Management in Delhi, the Capital of India", 1281.
[122] Salenson, "Waste Recycling Systems in Emerging Cities".
[123] Gupta and Arora, "A Study on Management of Municipal Solid Waste in Delhi", 131; de Bercegol, Cavé, and Nguyen Thai Huyen, "Informal Recycling Vs Municipal Waste Service in Asian Cities: Opposition or Integration to Municipal Service?", 8.

> landfill sites had exceeded their capacity way back in 2008. Most of these sites have contaminated the aquifers and groundwater in and around their neighbourhoods.[124]

Moreover, all three landfills have exceeded the permissible upper landfill limit of fifteen to twenty metres by far. To put it in perspective, Graph 9 exemplifies the height-wise competition with some of Delhi's classic and historic sites by 2016, which presents a very gloomy picture and outlook. While the landfill in Bhalswa is forty metres higher than the Lotus Temple, the Ghazipur and Okhla landfills amount to forty-five and more than forty-eight metres, and therefore tower higher than India Gate, which its forty-two metres in height.

[124] Singh Sambyal, "Delhi's Solid Waste: As Systemic Failure".

Graph 9: Heights of sights and landfill sites in Delhi in 2016



Source: Author's own.

One of the biggest challenges in relation to landfills is the potential methane production[125] and its release into the air. Moreover, the frequent landfill burnings cause a serious threat, especially since at any given time an average of 5,300 people work on Delhi's landfills.[126] The reduction of the amount of biodegradable material being disposed in landfills, is key in order to reduce the amount of methane being released.

> The potential for energy generation from landfill via methane extraction or thermal treatment is a major opportunity, but a key barrier is the shortage of qualified engineers and environmental professionals with the experience to deliver improved waste management systems in India.[127]

With 21 per cent of share in the overall treatment distribution, the management of MSW by recycling plays an important role in Delhi's MSWM. "Recycling is mostly run by the informal sector involved in waste separation. For this reason, data is scarce, making it impossible to properly estimate the genuine rate of waste diversion."[128]

> Throughout Delhi's waste management system, the resource recovery from waste is dominated by the informal sector. While the system is surprisingly efficient at recovering a high proportion of valuables from waste with minimal infrastructure and investment, it has its own drawbacks. Collection and sorting are carried out under unsanitary conditions that negatively affect the health of the workers as well as conditions surrounding the sites. After recovery of valuables, the rest of the waste is often openly dumped or burned by the workers, further aggravating environmental pollution and nuisance. Finally, informal sector workers only recover certain fractions that are either of highest value to them or are recoverable given rudimentary technology available to the sector. Therefore, some important fractions of the waste, e.g. compostable organics, demolition waste are ignored by the sector.[129]

Like the transfer stations, the landfills are another stage in the waste management system and involves waste workers as they segregate recyclables from there in order to then transport and sell them to recycling firms. These complexities surrounding Delhi's waste workers remain largely unrecognised by the formal system, although "[t]he resource management activities in Delhi are a rich mixture of government, private, informal and formal recovery and valorization."[130]

Waste-to-energy processes include a variety of technologies, such as incineration, gasification, pyrolysis and anaerobic digestion to convert MSW into heat, electricity or fuel.[131]

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125 See 3.1.2 and 3.1.9 for more information.
126 NGO representative, New Delhi, February 11, 2017.
127 Sunil Kumar, Stephen R Smith, Geoff Fowler et al., "Challenges and Opportunities Associated with Waste Management in India", *Royal Society open science* 4, no. 3 (2017): 1.
128 Le Courtois, "Municipal Solid Waste: Turning a Problem into Resource", 4.
129 Arora, Paterok, Banerjee et al., "Potential and Relevance of Urban Mining in the Context of Sustainable Cities", 4.
130 UN-Habitat, *Solid Waste Management in the World's Cities*, 59.
131 Atousa Soltani, Rehan Sadiq, and Kasun Hewage, "The Impacts of Decision Uncertainty on Municipal Solid Waste Management", *Journal of Environmental Management* 197 (2017): 306.

Delhi's main focus since 2016 is incineration, with two incineration-based waste-to-energy facilities, which incinerate 11 per cent of the overall MSW quantity. Since MSW in Delhi is, as mentioned earlier, high in organic material and high in inert content, the calorific value of the waste is low. For energy generation through incineration however, a minimum calorific value is required, otherwise the waste is unfit for burning. This is just one of the pitfalls which the involved stakeholders face during implementation of this method, which, till date, remains a controversial technology in the context of Delhi. This issue will be further elaborated in Chapter 5 of this research.

Since the amount of generated biodegradable material in Delhi's MSW is about half of the overall quantity, the city has huge potential for composting. The share of composting in the overall treatment mix however only amounts to 3 per cent. As of 2016, Delhi has three centralised composting plants at Bhalswa, Okhla and Ghazipur. Of the three existing composting plants only the two in Okhla and Narela-Bawana are running. The composting plant in Bhalswa was terminated in 2015 by the North Delhi Municipal Corporation.[132] However, even the two running plants do not function at the intended capacity. High operating and maintenance costs, improper segregation and poor operation are just some of the reasons why the plants cannot run to their full capacity.

2.3. Discussion and Summary

India's generation of MSW has grown immensely since the beginning of the 1990s, culminating to more than 60 million tonnes generated in 2016—a 30 per cent increase from the 1990s levels and almost 1,000 per cent increase since 1947. It is estimated that by 2047, the country will generate around 300 million tonnes per year, which will result in a staggering 4,900 per cent increase within a hundred years after India's independence. Delhi's generation of MSW reveals a similar development, with more than 9,500 tonnes per day being generated in 2016—a 130 per cent increase from the 2000s levels and an outlook of 17,000 to 25,000 tonnes per day by 2021, resulting in an increase of 100 per cent within six years. While China surpassed the United States (US) as the world's largest solid waste generator already in 2005, by 2025 India will, if the current trend continues, generate more total waste than the US.[133] The World Bank points out that "[…] India […] ha[s] disproportionately high urban waste generation rates per capita relative to overall economic status as they have large relatively

[132] Suraksha P., "Contract with Company Running Bhalswa Compost Plant in Delhi Terminated", *The Times of India*, October 15, 2015, https://timesofindia.indiatimes.com/articleshow/49391530.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst (last accessed April 10, 2019).
[133] Medina, *Solid Wastes, Poverty and the Environment in Developing Country Cities: Challenges and Opportunities*, 3.

poor rural populations that tend to dilute national figures."[134] Waste generation as well as the composition of MSW are strongly dependent on the local economy, lifestyle and infrastructure. It has been well established that the waste generation of an area is proportionate to the average income of the people of that area. It has also been observed that the generation of plastic and paper waste is more in high-income areas.[135] India's as well as Delhi's MSW composition has changed over the past thirty years, and one of the most significant changes is related to the fraction of recyclable material. Delhi's MSW composition mirrors the developments at the country level. Between 1982 and 2010, the proportion of recyclables in Delhi increased by more than 116 per cent. Considering this hike, one can estimate that the future percentage share of recyclables in Delhi will increasingly resemble the distribution of material in an urban area of a high-income country—a situation which underlines once again the urgent need for an effective MSW system, in which recycling and reuse have to be two core elements.

One of the main characteristics when analysing the MSW context in India and Delhi is the lack of consistent and congruent data. The partly conflicting data on the quantum of MSW generated in India underlines the lacuna of a system which periodically collects and updates the countrywide data base on the quantity and composition of MSW in the country.[136] "Without proper data collection and management, it is difficult to become accountable, transparent and even; to make effective strategies; and to budget for them. The absence of all of this, in turn, creates barriers for modern waste management systems."[137] Conversations with actors from the public and private sector reveal a common understanding: that metrics and frames of assessment, including source, type, generation rate and composition, to quantify the MSW challenge and develop management strategies is a requirement in order to monitor and control existing waste management systems. "Detailed classification and quantification of MSW is needed in order to obtain accurate data concerning estimates of present and future production and composition of MSW for long-term efficient and economical waste management planning"[138] It would be important to develop suitable MSWM strategies for Delhi, as a "(…) city that cannot effectively manage its waste is rarely able to manage more complex services such as health, education, or transportation."[139]

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134 Hoornweg and Bhada-Tata, *What a Waste: A Global Review of Solid Waste Management*, 10.
135 Ministry of Urban Development, *Swachh Bharat Mission Municipal Solid Waste Management Manual* (New Delhi: Government of India, 2016) 42.
136 Planning Planning Commission, *Report of the Taskforce on Waste to Energy 2014*, ix.
137 UN-Habitat, *Solid Waste Management in the World's Cities*, 2.
138 Narain and Singh Sambyal, *Not in My Backyard. Solid Waste Management in Indian Cities*, 16.
139 Hoornweg and Bhada-Tata, *What a Waste: A Global Review of Solid Waste Management*, Executive Summary.

The existing lacuna of quantum and composition data makes it difficult to deal with the waste itself, which becomes evident when analysing the MSW economy in Delhi. While only 60 to 70 per cent of the overall MSW is being collected in the first place, a minimum of 25 per cent, around 2,500 tonnes per day, is being collected by informal waste workers.[140] While Delhi's official waste management system would not be able to manage the generated waste, the activities of Delhi's waste workers have moreover a threefold value to the city and its inhabitants: firstly, the waste workers' activities have an economic value, as they save, on average, 20 per cent of MSWM costs for the municipalities. Secondly, the waste workers' activities have a socio-economic value since the work in the waste economy provides them a livelihood. Finally, the activities of informal workers have an environmental value as they contribute to the concept of circular economy[141] in a broader sense, by reducing the pressure on resources through recycling and reuse. However, the effectiveness of informal waste workers is hardly acknowledged by the local government, notwithstanding the fact that exploring and expanding synergies between the actors of the informal and the formal economy is crucial. As outlined earlier, collection, segregation and composting are mainly organised in a decentralised manner, while recycling and recovery of materials are organised centrally. Hence, the "(…) informal sector's expertise in collection, segregation and dismantling and the formal sector's expertise in advanced technological solutions for scientific disposal and recovery of materials (and energy) (…)"[142] could result in cooperative models, which would reinforce the potential of both the sectors, the formal and the informal.[143]

Having a processing and treatment capacity of around 6,000 TPD,[144] more than 65 per cent of Delhi's collected MSW still ends up in one of the overflowing landfills with minimal or no treatment. Unscientific waste handling, such as open dumping and waste burning, which remains a common method in dealing with MSW in Delhi, has a huge impact on the environment and the people.[145] "The choice of a disposal site is more a matter of what is available than what is suitable."[146] The shift towards incineration as Delhi's favoured

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[140] Swati Singh Sambyal, "Presentation", in *Valuing Waste or Wasting value? Rethinking waste processing in fast growing middle-income cities* (New Delhi: The CPR Scaling City Institutions for Sanitation programme and Agence Française de Développement, 2018).

[141] "A circular economy is a regenerative system in which resource input and waste, emission, and energy leakage are minimised by slowing, closing, and narrowing material and energy loops. This can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling." Claire Potter Designs definition and see Box 6 for a more detailed definition of circular economy.

[142] Chaturvedi, Arora, and Saluja, "Private Sector and Waste Management in Delhi: A Political Economy Perspective", 14; Agarwal, Marshall, Pandey et al., *Rethinking Urban Waste Management in India.*

[143] Agarwal, Marshall, Pandey et al., *Rethinking Urban Waste Management in India.*

[144] Singh Sambyal, "Presentation".

[145] Singh, "No More N-I-M-B-Y".

[146] Gangawane and Khilare, *Sustainable Environmental Management: Dr. Jayashree Deshpande Festschrift Volume*, 154.

treatment option opened up a whole new playing field, with a new set of actors and dynamics between existing actors, which is analysed in Chapter 5 of this research.

When looking at the partly parallel running municipal solid waste management systems in Delhi, it is evident that a successful adaptation and implementation of an MSWM system depends on a variety of factors. On the one hand are the key physical elements of public health, environment and resource management, which need to be addressed in order for a sustainable MSWM system to work. On the other hand, are certain governance strategies, which are based on inclusivity, financial sustainability, sound institutions and pro-active policies to deliver a well-functioning system. The government and ULBs "[…] need to take charge of the modernization process and to develop their own models for waste management that more than simply 'imperfect copies'" of an "[…] ideal system that operates in developed countries […]."[147]

> A good baseline analysis and a transparent stakeholder process will reveal one or more logical 'next steps' that each city can take to improve what they have and move the whole system towards effective, affordable performance. Because modern waste management is about much more than a 'technical fix', such next steps can relate to making the institutional framework stronger, sending waste system employees to training, shifting the recycling strategy to be easier for citizens, or phasing out energy-intensive approaches to collection. Technologies are visible evidence of humanity's best intentions to transform solid waste into a safe, inert substance. They carry the system, but they are not the system. And if they work at all, they do so because of the far less visible institutional, governance, policy and participative frameworks that are highly varied and complex, and directly related to local conditions.[148]

The experiences from the past highlight the Indian government's reliance on centralised technologies, which have not been tested as viable or ideal for the Indian context prior to implementation. This lack of assessment and required adaptation to the local context intensifies risks related to the environment, instead of facilitating alternative waste management strategies, such as collaborative work systems, which till date have only little influence on the mainstream.

[147] UN-Habitat, *Solid Waste Management in the World's Cities*, 4.
[148] Ibid., 5.

3. India's Municipal Solid Waste Management Agenda Between 1986 and 2016 in the Context of Development Drivers for Waste Management

The ever-growing amount of waste in India has an intense impact on the lives of citizens, whose growing awareness increases the burden on the (local) government. In order to set the scene for a better understanding of how India's MSWM agenda developed over the past three decades, it is important to outline the involved stakeholders. As highlighted in Table 2, in India, multiple actors from union, state and local government levels are involved in the country's MSWM system. MSWM is part of public health and sanitation, and the Central Pollution Control Board (CPCB) and the State Pollution Control Boards (SPCBs) are the regulatory bodies of the waste sector.[149] Their role includes ensuring compliance with the rules formulated by the MoEFCC. As per the constitution, MSW falls under the state list, and is the responsibility of the municipalities of the city or town. Activities surrounding collection, treatment and disposal of waste are regulated by state legislation and local acts. The 74th Constitutional Amendment (1992) transferred the responsibility for collection, treatment and disposal of MSW from state governments to the urban local bodies (ULBs), in order to streamline city management and improve the delivery of services. Since then, as highlighted in Table 2, every municipal authority is responsible for implementation of the provisions and development of infrastructure for collection, storage, segregation, transportation, processing and disposal of municipal solid wastes.

Table 2*:* MSW: Institutions and functions

Responsible institution	Roles and responsibilities in MSWM
Central government	Formulate laws and rules; frame policies; prepare guidelines, manuals and technical assistance; provide financial support; monitor implementation of laws and rules
State government	Make state-level laws and rules; frame policies; prepare guidelines, manuals and technical assistance; provide financial support; monitor implementation of laws and rules
Municipal authorities and state government	Plan for MSW/other specialised waste treatment facilities
Municipal authorities	Collect, transport, treat and dispose waste

[149] Ministry of Finance, *Position Paper on the Solid Waste Management Sector in India*, 8.

Municipal authorities with the approval of state governments	Frame by-laws; levy and collect fees
Municipal authorities and state and central governments	Finance solid waste management systems

Source: Based on Zhu, Asnani, Zurbrugg et al. (2008), 101.

The manifold involvement of a variety of ministries and line agencies in India's MSWM, as outlined in Table 3, underlines on the one hand the many roles and responsibilities that are attached to a potentially well-functioning MSWM system, and on the other hand, the complexity of India's administration and regulation system surrounding the issue of MSW that calls for a strong inter-ministerial convergence.

Table 3: MSW: Ministries and functions

Ministry	Roles and responsibilities in MSWM
MoEFCC	Overall monitoring of implementation of rules through a central monitoring committee consisting of MoUD, Ministry of Rural Development (MoRD), MoEFCC, Ministry of Agriculture (MoA), CPCB, SPCB, Urban Development Departments (UDDs), Rural Development Departments (RDDs), ULBs, Census Towns, Federation of Indian Federation of Indian Chambers of Commerce & Industry (FICCI), Confederation of Indian Industries (CII), and subject experts
MoUD	Coordination, periodic review, implementation of projects; national policy and strategy (including policy on WtE) in consultation with stakeholders; promoting R&D, training and capacity building
Ministry of Chemicals & Fertilisers (Department of Fertilizers)	Market development assistance in City Compost; ensure promotion of co-marketing of compost with chemical fertilisers
Ministry of Agriculture (Department of Agriculture Cooperation & Farmers Welfare)	Propagate and test city compost; provide flexibility in Fertiliser Control Order for manufacturing and sale of city compost
Ministry of Power	Decide tariff for power from WtE; compulsory purchase of power from WtE plants by distribution companies

Ministry of New and Renewable Energy Sources	Facilitate infrastructure creation for WtE and provide subsidy or incentive for WtE plants
Ministry of Road Transport and Highways	Notification to use plastic waste for the construction of national highways
CPCB (MoEFCC)	Formulation of standards; review of environmental standards (leachate in respect of all processing and disposal facilities); review of environmental standards
Central Public Works Department (MoUD)	Notification of mandatory use of recycled portion of C&D waste in construction (if the same is available within 100km of the construction site)
National Environmental Engineering Research Institute (NEERI) (Ministry of Science and Technology)	Research and development of improved solid waste management system

Source: Author's own.

The landscape of rules and policies related to MSW in India has undergone major developments and shifts during the past three decades: 1986 is the starting point for the analysis at hand, as it marks the year in which the GoI enacted the Environment (Protection) Act 1986 (EPA), which lays the foundation of and builds the structure for subsequent policies related to municipal solid waste in India. It is under the provision of this act that rules for managing and handling MSW waste have been framed.[150] Over the past thirty years, a variety of factors and development[151] drivers for municipal solid waste management have impacted the developments in India's MSWM policy landscape. Understanding what has driven India's MSW political agenda setting in the past thirty years and then to analyse what the drivers for MSW developments are today is an essential prerequisite when aiming at a better understanding of India's MSWM—past, present and potential future. The inventory of relevant municipal solid waste government documents in Appendix-I: Inventory of Relevant Municipal Solid Waste Government Policy Documents serves as the backdrop for the following chapter. In that chapter, an attempt is made towards a more detailed understanding about exactly these developments in India's policy, and the interlocking with relevant development drivers for municipal solid waste management during the past three decades.

[150] Arora, Paterok, Banerjee et al., "Potential and Relevance of Urban Mining in the Context of Sustainable Cities", 5.
[151] See Footnote 43 for an explanation of the term development.

3.1. Development Drivers for India's Municipal Solid Waste Management

Since the middle of the nineteenth century, some forces have been driving the development and improvement of waste management systems in the global context of waste management. While the driver of resource value of waste has been a systemic driver ever since there was waste, the driver of public health rose to be an important driver in the middle of the nineteenth century, and the driver of environmental protection became an essential driver for MSWM from the middle of the twentieth century onwards. These three drivers are usually considered to be primary drivers, which have contributed to the development of municipal solid waste management systems around the world.[152] In addition, more specific development drivers, "(…) mechanisms or factors that significantly impact development in solid waste management (…)"[153] have been identified as crucial for the development of municipal solid waste management. Depending on local circumstances, these specific drivers occur in combinations or sets, and these combinations differ from country to country and sometimes even from city to city. In other words, there is no one single driver for development which brings about the necessary change in a waste management system. There is a balance between groups of drivers, which usually varies over time, depending on the context and the stakeholders involved.

The balance between drivers for development in India's municipal solid waste management has varied significantly over the past thirty years, with the classical drivers opening the debate on India's MSWM and new drivers joining that set in more recent times.

3.1.1. Driver 1: Public Health

Protection of public health was one of the key drivers behind the first attempts to establish solid waste management systems. Since the middle of the nineteenth century, when cholera and other epidemics spread in cities of the Global North, existing sanitation issues were addressed through the introduction of legislation related to the improvement of public health. These public health issues underlined the requirement of a formalised system of waste collection, which led to an (enhanced) involvement of municipalities in removing solid waste and municipal authorities' responsibility for a city's cleanliness.[154]

In India, the plague epidemic in Surat in 1994, where uncollected MSW blocked drains, leading to flooding and the outbreak of a plague-like disease, is seen as the onset of a chain

[152] Wilson, Rodic-Wiersma, Modak et al., *Global Waste Management Outlook, United Nations Environment Programme (UNEP) and International Solid Waste Association (ISWA)*, 27+28.
[153] Wilson, "Development Drivers for Waste Management", 198.
[154] Ibid., 198; UN-Habitat, *Solid Waste Management in the World's Cities*, 19.

of processes in which public health played an important role. Once the connection between cholera and other infectious diseases, which had reached Indian cities, and poor sanitation conditions was made, citizens' demands for improved waste handling by the municipalities continued to rise.

> The outbreak of plague in Surat, India in 1994 was attributed (at least in part) to rats breeding on uncollected refuse that was blocking drains and water channels. This led to the successful petitioning of the Indian Supreme Court by citizen groups, seeking to force the major municipalities to tackle their waste management problem.[155]

The public health crises in various Indian cities eventually led to the introduction of legislation addressing the problem of poor sanitation systems. Protests and Public Interest Litigations (PILs)[156] demanding that the state improve solid waste management increased the pressure on the government. As a result, multiple expert committees were set up at the national and city levels, and new initiatives taken to collect waste and maintain the cleanliness of a city.[157] Till date, public health remains a key driver in India, especially due to climate conditions which require daily waste collection in order to avoid clogging of drains and, consequently, flooding, and eventually the spread of waterborne and vector-borne diseases such as typhoid, dengue fever and chikungunya.[158]

3.1.2. Driver 2: Environmental Protection

Environmental protection as one of the key development drivers for waste management dates back to the 1970s, when crisis related to contamination from waste occurred in countries of the Global North. Intensified political and media discussion led to this driver coming to the forefront in discussions around solid waste management and to the provision of immediate stimulus for change. Eliminating uncontrolled dumping and open burning were two issues which were initially addressed at that time. This was followed by a stronger focus on technologies and standards to improve the handling of solid waste.[159]

In India, the shift towards environmental protection in the context of solid waste management occurred in the 1990s: crises of contamination of water, air and land, and the subsequent impacts on the health of those living close to the source, led to an increased demand for stringent rules. Many PILs at that time were related to environmental challenges, such as

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155 Wilson, "Development Drivers for Waste Management", 202.
156 Public Interest Litigation (PIL) allows citizens to challenge local, state and federal legislations in court in the name of 'public interest'.
157 Schindler, Demaria, and Pandit, "Delhi's Waste Conflict", 18; UN-Habitat, *Solid Waste Management in the World's Cities*, 21+142.
158 UN-Habitat, *Solid Waste Management in the World's Cities*, 22.
159 Wilson, "Development Drivers for Waste Management", 198.

the PIL *B. L. Wadhera versus Union of India and others* in the year 1996, which was directly linked to the situation in Delhi, about which Wadehra, a judicial activist, states:

> The authorities, responsible for pollution control and environment protection, have not been able to provide clean and healthy environment to the residents of Delhi. The ambient air is so much polluted that it is difficult to breathe. More and more Delhi-ites are suffering from respiratory-diseases and throat-infections. River Yamuna—the main source of drinking-water supply—is the free dumping-place for untreated sewage and industrial waste. Apart from Air and Water pollution, the city is virtually an open dust-bin. Garbage strewn all over Delhi is a common sight. The Municipal Corporation of Delhi (the MCD) constituted under the Delhi Municipal Corporation Act, 1957 (Delhi Act) and the New Delhi Municipal Council (the NDMC) constituted under the New Delhi Municipal Council Act, 1994 (New Delhi Act) are wholly re-miss in the discharge of their duties under law.[160]

In another PIL from the year 2000 by Almitra Patel, an environmental policy advocate, picks up the same thread and states:

> It is indeed unfortunate that despite more than sufficient time having elapsed the condition of Delhi has not improved. The citizens of Delhi increasingly suffer from respiratory and other diseases, the river Yamuna is highly polluted and garbage and untreated domestic and industrial waste is being either freely dumped into the said river or is left on open land, large volume of which remains unattended.[161]

This prompted new laws, and the environmental crises catalysed political processes that eventually resulted in the passage of the first Municipal Solid Waste (Management and Handling) Rules, 2000. Environmental protection has since remained a major priority of the government, which also reflects in the National Environment Policy, 2006, or campaigns such as *Swachh Bharat Abhiyan* (*Swachh Bharat* Mission (SBM)), the Clean India Mission, which was launched in 2014.

With the Solid Waste Rules, 2016, legislation is in place. However, till date, uncontrolled or open dumping is the norm, and despite the fact that the driver of environmental protection has gained momentum in the Indian MSW context over the past two decades, there is still a major focus on initial steps—the priority continues to be to phase out uncontrolled dumping and introduce engineered landfills or full sanitary landfills, as open dumping and burning of garbage adds to environmental pollution.[162] Landfills particularly are considered as epicentres of air pollution and soil and groundwater contamination. On the one hand, they release large quantities of methane and carbon monoxide, two extremely potent greenhouse gases (GHG). Moreover, frequent landfill fires add to air pollution as the smoke contains black carbon. On the other hand, the breakdown of biodegradable waste in landfills

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[160] *Dr. B.L. Wadehra V s. Union of India and Others, 1996 Scc (2) 594, Jt 1996 (3) 38*, 1 (1996).
[161] *Almitra H. Patel and Anr. Petitioners V s. Union of India and Ors., Writ Petition (C) No. 888 of 1996*, 1–2 (2000).
[162] Wilson, "Development Drivers for Waste Management".

may release chemicals such as heavy metals, resulting in landfill leachate, which can contaminate the local groundwater and soil, and consequently pose a risk to public health and the environment.

3.1.3. Driver 3: The Resource Value of Waste

The resource value of waste as a core development driver for MSWM is a particularly complex development driver for municipal solid waste management, as it incorporates two parallel aspects which need to be considered when addressing this driver.

Firstly, the resource value of waste has been a core driver for waste management, since the work with waste has always provided income opportunities for the poor. While it has been an important historical driver for waste management in the Global North as well, it remains a major driver in the Global South till date. Before industrialisation in the Global North, resources were relatively scarce, which led to a high rate of household items being repaired and reused. Organic material was usually used in the agriculture sector to feed animals or fertilise the soil. With industrialisation, recovering, collecting, and using or selling saleable materials from waste became an economic niche and a means of livelihood for the urban poor.

Making a living off discarded material is still a key driver in many countries of the Global South, such as India, although it is a somewhat invisible driver. The informal sector has always played a key role in India's MSWM and recycling as it reduces the burden on the functioning of the formal system.[163] Informal sector activities in resource recovery usually require little or no capital, so waste, seen as a resource, provides an opportunity to earn a living without substantial investment. At the same time, however, this activity has no proper permits or legal status, leaving one exposed to unstable employment amid unsafe working conditions with operational risks and injuries.[164] Although being an inherent driver for MSWM in India, this force has been neglected or not recognised at a policy level until recently.

Secondly, around the 1970s, the debate around the resource value of waste as a development driver for municipal solid waste management broadened, as another layer to this driver was introduced—this was the concept of the waste hierarchy,[165] following which the debate transformed. Especially in Europe, this driver regained momentum, as the historical driver of the resource value of waste and the concept of waste hierarchy were strongly linked. While

[163] Chaturvedi, Arora, and Kilguss, "E-Waste Recycling in India–Bridging the Formal–Informal Divide", 205.
[164] Chaturvedi, Arora, and Saluja, "Private Sector and Waste Management in Delhi: A Political Economy Perspective".
[165] See Chapter 1.4 in this research.

on the one hand recycling is considered statutory as "(…) recycling is practised because it is the right thing to do not because the value of the recovered materials covers the costs"[166], on the other hand, the move towards favourable options of reduction, reuse, recycling and energy recovery, which are promoted in the waste hierarchy, are a very profitable business.

> Most waste material can be regarded as unused resources, so environmentally sound waste management entails the reduction of waste in production and distribution processes and the enhancement of re-use and recycling. In Northern cities these principles are being translated into practice through government regulation, stakeholder cooperation and citizens' initiatives. In southern cities, solid waste management is still focused on improving the conventional engineering systems (essentially, the collection, transport and disposal of solid wastes).[167]

In recent years, in India as well, the understanding of this driver transformed, as representatives from the formal private sector and more and more public sector representatives recognise the value of waste and the attached economic rewards when systems are put in place sustainably.

3.1.4. Driver 4: Institutional Responsibility and Good Governance

Institutional responsibility as a development driver for waste management was introduced in the Global North during the nineteenth century and is now very well established. Even the ongoing privatisation of collection and disposal services does not relive the assigned municipalities of their responsibilities.

> The modernization of the solid waste management system often sees establishment of new policies, regulations and possible restructuring of management and administration to better address the minimization of public health and environmental impacts while maximizing the recovery of resources from the waste stream. Thus, good governance becomes a driver for a sustainable and adaptable solid waste system.[168]

Embedding institutional responsibility in a functioning waste management in a country like India poses a whole set of challenges. The central and state governments, each at their respective level, formulate laws and rules, frame policies, prepare guidelines, manuals and technical assistance, provide financial support, and monitor the implementation of laws and rules. The municipal authorities and state governments plan for MSW and other specialised waste treatment facilities. The 74th Constitutional Amendment (1992) transferred the responsibility for collection, transport, treatment and disposal of MSW from state governments to the ULBs. In addition to this, the municipalities, in accordance with the respective state governments, frame by-laws, and levy and collect fees. While the implementation and monitoring

[166] Wilson, "Development Drivers for Waste Management", 200.
[167] Furedy, "Garbage: Exploring Non-Conventional Options in Asian Cities", 42.
[168] UN-Habitat, *Solid Waste Management in the World's Cities*, 39.

of rules pose challenges for the respective stakeholders involved, the MSW situation in the country clearly reflects the constraints of India's municipalities in terms of lack of finances, skills and knowledge, as a result of which institutional strengthening and capacity building become major drivers in this context.[169]

In light of these constraints and in the absence of enhanced responsibility, management commitment or strong ownership, the local drivers are weakened, which makes space for international actors to step in in the form of international financial institutions (IFIs), such as the World Bank or international cooperation agencies. Over the past three decades, these international actors have increasingly become important drivers for waste management in the Indian MSW context, as discussed in section 3.1.8.

In recent years, certain policy and economic instruments have become important as drivers within the institutional driver context in India, such as the concept of extended producer responsibility (EPR). "Extended Producer Responsibility makes producers financially responsible once their products become waste, providing them with an incentive to develop products which avoid unnecessary waste and can be used in recycling operations."[170] In EPR, the producer leads the charge in managing the environmental impact of their respective product throughout the life-cycle, including collection, recycling and safe disposal. In addition, the introduction of 'pay-as-you-throw' (PAYT) schemes are becoming more widespread; here the waste generator has to pay directly and in accordance with the amount of waste produced. These instruments and schemes will be looked at in more detail in the later course of this research, when embedding this upsurge in the recent political developments.

Another aspect which is important to mention in the context of development drivers, and when analysing the situation in India, is the cultural aspects surrounding the whole topic of waste. As mentioned earlier, in most parts of India, MSW is still considered something 'dirty,' and the main focus is on the removal of the refuse from the field of vision. If refuse is not seen as a good, and the work with waste is viewed with aversion, it eventually hinders a certain level of professionalism which also spills into the related institutions. One main aspect in this regard is the level of awareness, which will be addressed in the following section.

3.1.5. Driver 5: Public Awareness

Public awareness and opinion are important drivers for MSWM. Environmental issues, such as climate change, resource and waste management, have emerged as key issues in terms of public perception in many countries of the Global North. While waste management usually

[169] Wilson, "Development Drivers for Waste Management", 203.
[170] European Commission, *Being Wise with Waste: The Eu's Approach to Waste Management* (Luxembourg 2010) 6.

moves up the hierarchy of people's priorities as living standards increase, political and media discussion about the topic is an immediate stimulus for change.

This is also the case in India, where poor waste management, especially in urban areas such as Delhi, Bangalore or Mumbai, continues to move into the focus of the public. On the one hand, the PILs, which increasingly address issues related to environmental concerns such as air pollution, waste management and health, serve as an indicator of an increasing awareness on the part of citizens. On the other hand, environment-related initiatives which are being launched by the central and state governments have placed these issues more prominently on the public agenda. The topics of climate change, waste management and, more recently, resource management, increasingly appear on the Indian political agenda: one of the prominent initiatives in recent years is *Swachh Bharat Abhiyan*, which was launched in 2014. It addresses issues surrounding sanitation and waste management and has proved itself to be effective as good publicity as well as effective bringing the topics to the public eye. This publicity is particularly enhanced by the involvement of Indian actors, such as Ambitabh Bachchan, who was requested by the government to become the face and voice of the campaign.

"The need to improve public awareness of, and community participation in, waste management has been widely recognised"[171] and paved the way for environmental NGOs across the country to step in and create awareness in regard to the environmental damages the ill-managed solid waste management system in the country is leading to. Moreover, numerous NGOs address social justice concerns of the waste workers in an integrated manner, advocating their rights and organising the activities of these informal waste professionals. Delhi as the capital especially draws public, political and media attention to its insufficiently functioning solid waste management system; a system which plays an important part in contributing to being one of "(…) the world's most polluted cities in the world (…)."[172]

3.1.6. Driver 6: Cleanliness and the Public Image

In the Global South, the cleanliness of a city is considered one of the main development drivers for waste management. This is also true for India, as one of the key drivers mentioned in all relevant literature refers to the cleanliness.[173] A 'clean city' with a functioning

[171] Wilson, "Development Drivers for Waste Management", 204.
[172] Malavika Vyawahare, "Delhi World's Most Polluted City, Mumbai Worse Than Beijing: WHO", *Hindustan Times*, May 2, 2018, https://www.hindustantimes.com/india-news/delhi-world-s-most-polluted-city-mumbai-worse-than-beijing-who/story-m4JFTO63r7x4Ti8ZbHF7mM.html (last accessed April 11, 2019).
[173] UN-Habitat, *Solid Waste Management in the World's Cities*, 58; Wilson, "Development Drivers for Waste Management", 202; Chaturvedi, Vijayalakshmi, and Nijhawan, *Scenarios of Waste and Resource Management: For Cities in India and Elsewhere.*

environmental infrastructure and waste management system is supposed to attract (foreign) investment and can, in addition, stage prestigious events.[174]

According to UN-Habitat, Delhi's main driver for waste management is the public image of the city.[175] As the present research does not aim to prioritise one driver over another, it recognises the driver of cleanliness as one among multiple drivers which can have varying relevance for the development of municipal solid waste management. In the 1990s, protests and PILs increased the pressure on Delhi's government, which led to new initiatives to collect waste and maintain the cleanliness of the city.[176] Delhi's Master Plan 2021, which was published in 2007, envisions a Delhi by 2021 as a "(…) a global metropolis and a world-class city, where all the people would be engaged in productive work with a better quality of life, living in a sustainable environment."[177] Few of the mentioned infrastructural developments though are "(…) scheduled to be completed in early 2010, in line with the Commonwealth Games being hosted in Delhi."[178] The 2010 Commonwealth Games have been widely discussed and criticised as an example of the assumption that the cleanliness and public image of a city is often connected to hosting such events.[179] At the time, ULBs invested heavily in the ad-hoc development of Delhi's infrastructure and the modernisation of SWM services prior to the Commonwealth Games.[180] The mode of operation of the government as well as the sustainability of the infrastructural changes are being debated and questioned since then.

> The goal of portraying Delhi as a 'world class' city and an international sports destination, led the Indian government—both at the state and central level—to lose sight of its priorities and legal and moral commitments to its people.(…) The HLRN report raises the critical question that if India is really looking for genuine and long-lasting national prestige, would this not come if it spent available resources on providing food, housing, education, sanitation, water, and healthcare for its population instead of on a mega sports event?[181]

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174 Wilson, "Development Drivers for Waste Management", 202.
175 UN-Habitat, *Solid Waste Management in the World's Cities*, 58.
176 Schindler, Demaria, and Pandit, "Delhi's Waste Conflict", 18; UN-Habitat, *Solid Waste Management in the World's Cities*, 21+142.
177 Delhi Development Authority (DDA), *Master Plan for Delhi - 2021* (New Delhi: Delhi Development Authority (DDA), 2010) 2.
178 Ibid., 122.
179 Geeta Pandey, "Delhi Loses Patience with Commonwealth Games", BBC, https://www.bbc.com/news/world-south-asia-11101288 (last accessed April 10, 2019); Shalini Mishra, Shivani Chaudhry, and Miloon Kothari, *The 2010 Commonwealth Games: Whose Wealth? Whose Commons?* (Housing and Land Rights Network, South Asia Regional Programme, Habitat International Coalition, 2010); Housing and Land Rights Network (HLRN), "Comprehensive Report on Commonweatlh Games Launched in Delhi: Panel of Experts Questions Secrecy and Undemocratic Nature of CWG Process", News release, May 13, 2010, https://casi.sas.upenn.edu/sites/default/files/iit/Whose_Wealth_Whose_Commons_press_release.pdf.
180 UN-Habitat, *Solid Waste Management in the World's Cities*, 58.
181 Housing and Land Rights Network (HLRN), "Comprehensive Report on Commonweatlh Games Launched in Delhi: Panel of Experts Questions Secrecy and Undemocratic Nature of CWG Process".

Often, the attempt at a 'clean city' is supported by government initiatives and campaigns, as was the case in Delhi in 2014. At the time, the Delhi government, together with resident welfare associations (RWA's) and schools, launched a Clean Delhi Drive campaign[182] which aimed at making the capital green and clean. In that campaign, which ran for seven days just before Independence Day, all schools and educational offices as well as RWAs were involved in cleaning up campuses and school premises. While these kinds of campaigns underline the government's understanding of the relevance of public awareness, the question is: how far can a seven-day campaign lead to a sustainable and lasting change in the city's cleanliness? Developments surrounding the cleanliness of a city as a driver for waste management unfold in a way that makes one ask if the motive behind the establishment or maintenance of the cleanliness of a city, such as Delhi, is predominantly driven by economic reasons, such as to attract investments or position the city in a certain global context. A representative of one of the leading NGOs in the field of MSWM in India goes even further and states that "cleanliness is not an aspect which is relevant to the government."[183] Therefore, the question that arises is whether cleanliness as an individual driver for waste management should rather be considered as a driver incorporated within the context of business interest and profit motive as a driver, which will be further elaborated in section 3.1.7.

3.1.7. Driver 7: Free Market—Business Interest and Profit Motive

Business interests and profit motives play an important role as drivers for waste management in countries of the Global North as well as in the Global South.

When analysing the development drivers in India and their evolution for municipal solid waste management in the Indian context, it becomes evident that the free market as a driver for MSWM has gradually begun to play a central role in MSWM as it is strongly interlinked with several other drivers. Thus, are the drivers such the resource value of waste, cleanliness of a city and circular economy directly linked to aspects of business interests and profit motives? As mentioned earlier, representatives of the formal private sector as well as of the public sector are gradually becoming more interested in the resource value of waste as it has profits which were often overlooked in the past. As mentioned, cleanliness as a driver of MSWM is often in itself driven by the aim to attract investments and to create a positive public image to position the city nationally, regionally or globally. The concept of a circular economy as a driver has been gaining momentum in recent years, while the promotion of

[182] Government of NCT of Delhi, "Clean Delhi Drive", Government of NCT of Delhi, http://delhi.gov.in/wps/wcm/connect/doit_dpg/DoIT_DPG/Home/Miscellaneous/Delhi+Drive/ (last accessed April 10, 2019).
[183] NGO representative, New Delhi, May 20, 2017.

the concept itself is often accompanied by the promise of profitable business opportunities. In that way, profit motives and business interests have become very relevant drivers in the Indian context.

One of the common slogans of the Indian government, "from wealth to waste"[184], underlines the predominant notion behind a functioning MSW system. And the continuous privatisation of elements of the MSWM chain is only one aspect of this development in recent years. The implementation of incineration technologies in Delhi in the past years aims on the one hand to remove MSW from the streets, and on the other hand, to generate wealth out of this incinerated waste in the form of energy. While many stakeholders criticise the interest-driven agenda which focusses on wealth out of waste through incineration, it is the same stakeholders who focus strongly on the issue of a viable business to drive Delhi's MSWM vehicle in a more favourable direction. It is a common understanding among relevant stakeholders that industries need to be on board whenever MSW strategies are being discussed or adapted. One of the key concerns at conferences and workshops on the subject is the need to develop a viable business plan in order to bring industries on board.

This relevance and need for a viable business are also one of the main criteria in the ongoing public debate around the topic of MSW and subsequently resource management. The fact of an ever-growing amount of MSW in combination with an overloaded or non-functioning MSW system, and, as a consequence, the impact on the environment and people, is seemingly not reason enough to concentrate on the primary drivers of public health or environmental protection. Instead, the question of "What is in it for me?" and the search for satisfying answers to this often surround related conferences; or, as an NGO representative in Delhi puts it, "'Let's save the environment' and 'let's create livelihood' does not raise municipalities' ears as much as 'let's save money' and 'let's make money'. The government is motivated by the economics of waste."[185]

3.1.8. Driver 8: International Cooperation and International Finance Institutions

In many low- or middle-income countries, international cooperation and international finance institutions become effective drivers when local drivers for MSWM such as strong institutions or strong legislative frameworks are lacking. This kind of scenario often leads to an overall lack of ownership for the issue at hand.[186] Usually these institutions address key

[184] Ministry of Housing and Urban Affairs, *Waste to Wealth. A Ready Reckoner for Selection of Technologies for Management of Municipal Waste* (New Delhi: Government of India, 2017).
[185] NGO representative, New Delhi, May 20, 2017.
[186] Wilson, "Development Drivers for Waste Management", 203.

constraints of the municipal solid waste management system, such as lack of finances and capacities, and therefore focus on core elements such as institutional strengthening, capacity building, good governance as well as creating awareness.

For more than three decades, India has been the ground for many such interventions, either in the form of programmes, projects or studies, with the involvement of institutions such as the Asian Development Bank (ADB), the EC, the WB, or bilateral cooperation agencies. While it is not the domain of this research to analyse or categorise the impacts of MSW-related projects and publications initiated by international cooperation and finance institutions as desirable or not, or as successes or failures, it can be said that international cooperation and international finance institutions have established themselves as drivers for India's MSWM throughout these decades. Multiple publications in the late 1990s and early 2000s[187] promote the privatisation of elements of MSWM by claiming that it is the most efficient way to handle this waste stream. While the direct impacts of the promotion of MSWM privatisation through international cooperation and finance institutions on India's MSWM framework is yet to be fully understood, some scholars have observed these developments critically.[188]

3.1.9. Driver 9: Climate Change

During the last two decades, the importance of climate change as a driver for waste management has gradually increased. Since the early 1990s, climate change has directed the attention of countries in the Global North to the fact that biodegradable MSW which is disposed in landfills results in increased methane emissions. Methane, a main greenhouse gas, twenty-five times more potent than carbon dioxide, forms when organic material decomposes in the absence of air. This process is called anaerobic decomposition. In order to reduce the amount of methane, cities worked on processes to keep biodegradables out of landfills by diverting this fraction of MSW. In 2010, around 3 per cent of MSWM and waste water contributed to the global GHG emissions.[189]

> Recognition of the need for assessing the implications of Climate Change in India coincides with the emergence of the issue of global warming in late eighties and early nineties. Globally, the decade of 1990's which saw the adoption of the United Nations Framework Convention on Climate Change (UNFCCC) and the publication of the update on Climate Change 1992 by the Inter Governmental Panel on Climate Change (IPCC) could be taken as the beginning of preparation of the dedicated assessments of climate change. In the Indian context, researchers initiated work in their own limited fields. By all means the

[187] Cointreau, Gopalan, and Coad, "Private Sector Participation in Municipal Solid Waste Management: Guidance Pack (5 Volumes)"; Zhu, Asnani, Zurbrugg et al., *Improving Municipal Solid Waste Management in India: A Sourcebook for Policy Makers and Practitioners*.
[188] Brooks Anderson, "Privatisation: A Formula for Provision or Perversion of Municipal Solid Waste Management", *Clear Impression Documentation Services* (2011): 6.
[189] UN-Habitat, *Solid Waste Management in the World's Cities*, 19.

> information was scattered, diffused and fragmented on various aspects of Climate Change. The only source of information on climate was available through India's Meteorology Department (IMD) and the Indian Institute of Tropical Meteorology (IITM) and certain premier institutes such as Indian Institute of Science (IISc) and the Indian Space Research Organization (ISRO) and its associated institutions.[190]

In the 1990s and early 2000s, several climate change assessments, in which the impacts of climate change on various sectors, such as agriculture, water and forests, were undertaken.[191] Since the mid-2000s, the engagement with the topic of climate change in relation to MSWM became enmeshed. While India's Initial National Communication to the UNFCCC from 2004 clearly addresses the link between biodegradable disposal in landfills and methane emissions, the National Action Plan on Climate Change, published in 2008, encompasses a range of measures, of which one, the National Mission in Sustainable Habitat, is related to the improvement of solid waste management.[192]

As mentioned earlier, India's landfills are considered epicentres of air pollution as they release large quantities of methane. In 2007, overall GHG emissions in India amounted to around 1.7 billion tonnes, of which 3 per cent, or 57.7 million tonnes, were covered by the waste sector (MSWM and waste water). Data shows that municipal solid waste contributes about 22 per cent to the 57.7 million tonnes of GHG from the waste sector, about 5 to 6 per cent of which is methane from landfills.[193] Current perspectives in India focus on the promotion of decentralised composting in order to reduce the biodegradable component in landfills and move towards a renewed focus on energy recovery from waste.

3.1.10. Driver 10: Circular Economy

During the past ten years, the concept of circular economy has become increasingly important as a driver for solid waste management in the Global North. Within the concept of circular economy, waste prevention, reusing waste back into the production of new products and recycling are key priorities. While this driver is in essence related to the resource value of waste as a driver for MSWM, the concept of circular economy encompasses more elements as it is seen as a holistic approach to MSW, including elements of the waste hierarchy concept. The European Union adopted a Circular Economy package in 2015 and China

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[190] Indian Network for Climate Change Assessment, *India: Greenhouse Gas Emissions 2007*, 2.

[191] PR Shukla, Subodh K Sharma, and P Venkata Ramana, *Climate Change and India: Issues, Concerns and Opportunities* (Tata McGraw-Hill Publishing Company, 2002); Global Environment Facility and Asia Least-Cost Greenhouse Gas Abatement Strategy Project, *Asia Least-Cost Greenhouse Gas Abatement Strategy: Algas: Viet Nam* (Asian Development Bank, 1998); AP Mitra, Subodh Sharma, Sumana Bhattacharya et al., "Climate Change and India: Uncertainty Reduction in Greenhouse Gas Inventory Estimates", *Climate change and India: uncertainty reduction in greenhouse gas inventory estimates.* (2004).

[192] Prime Minister's Council on Climate Change, *National Action Plan for Climate Change 2008* (New Delhi: Government of India, 2008).

[193] Indian Network for Climate Change Assessment, *India: Greenhouse Gas Emissions 2007*, i+38.

adopted a Circular Economy Promotion Law in 2009.[194] In both, waste management plays a crucial role, as waste prevention and recycling of selected materials and waste fractions are essential in order to promote a circular economy.

Box 6: Concept and key aspects of a circular economy

Definition by the European Commission:

In a circular economy, the value of products and materials is maintained for as long as possible. Waste and resource use are minimised, and when a product reaches the end of its life, it is used again to create further value. This can bring major economic bene fits, contributing to innovation, growth and job creation.[195]

Transition towards a circular economy leading to:

- Providing an alternative to a traditional linear economy (make, use, dispose) by maintaining the value of products, materials and resources in the economy for as long as possible
- Minimising waste generation
- Reusing waste back into the production cycle for the production of new products
- Bringing economic, social and environmental gains

Key drivers of a circular economy:

- Sustainable production and consumption
- Integrated product policy
- Zero waste

Source: Author's own, based on data from EC, http://ec.europa.eu/environment/circular-economy/index_en.htm (last accessed April 8, 2019).

The concept of circular economy is a more recent development driver for MSWM in the Indian context. It has now gained prominence as a policy goal for sustainable development.[196] NITI Aayog has been identified as a facilitator and MoEFCC as a leading line Ministry to drive the circular economy discourse in India. In November 2017, NITI Aayog, in collaboration with the European Union delegation to India, released a Strategy on Resource Efficiency, which emphasises that:

[194] European Commission, *Closing the Loop - an Eu Action Plan for Circular Economy* (European Commission, 2015).
[195] European Commission, "Implementation of the Circular Economy Action Plan", European Commission, http://ec.europa.eu/environment/circular-economy/index_en.htm (last accessed April 10, 2019).
[196] Delegation of the European Union to India and Bhutan, "India-EU to Strengthen Cooperation in Environment, Resource Efficiency and Circular Economy", News release, 2017, https://eeas.europa.eu/delegations/india_en/29227/%20India-EU%20to%20strengthen%20cooperation%20in%20Environment,%20Resource%20Efficiency%20and%20Circular%20Economy; Forest and Climate Change Ministry of Environment, "Javadekar Announces Formation of Indian Resource Panel", news release, November 18, 2015, http://pib.nic.in/newsite/PrintRelease.aspx?relid=131658.

> Resource Efficiency and Circular Economy are important goals and central principles for achieving sustainable development. Resource efficiency very simply put is making more with fewer materials. In practice, through a life-cycle approach, it leads to minimizing impact on environment & the associated societal burdens, transforming 'waste' into 're-sources' fostering circular economy, and strengthening resource security.[197]

Circular economy as a driver therefore comprises elements of the drivers of the resource value of waste, environmental protection, climate change and also business opportunities and profit motive.

[197] NITI Aayog, "NITI Aayog and EU Delegation to India Release the Strategy on Resource Efficiency (RE)", news release, 2017, http://pib.nic.in/newsite/PrintRelease.aspx?relid=174013.

Box 7: Ten selective development drivers for India's municipal solid waste management

Groups of drivers	Historical perspective	Current perspective	Key remaining challenges
Public health	Emerged as a key driver for MSW collection during outbreak of plague in Surat in 1994	Remains a key driver till date, especially due to India's climate conditions	• The dominant method remains uncontrolled dumping • Uncollected MSW clogs drains and causes flooding, leading to the spread of waterborne diseases • Open burning of waste leads to health threats through air pollution
Environmental protection	Emerged in the 1990s, when public interest litigations were related to environmental challenges	Focus remains on initial steps, e.g. phasing out uncontrolled and open dumping, and introduction of engineered landfills or full sanitary landfills	• Uncontrolled, open dumping and burning of MSW are still very common methods, resulting in adverse effects on the environment (water sources, air, soil etc.) • Elimination of open dumping is a stepping stone towards sound waste disposal and treatment
Resource value of waste	Making a living by recovering saleable materials has been a key driver	Remains a key driver, as it provides a livelihood for a large number of India's urban poor	• Utilisation of synergies between the informal and formal waste economy in order to achieve higher recycling rates • Sustainable integration of informal waste workers
Institutional responsibility and good governance	Emerged as a driver in 1992, when municipalities were assigned the	Remains a key driver (promoted through capacity building by IFIs; in more recent years, policy	• ULB's ability to discharge their function is still limited

	duty for collection, transport, treatment and disposal of MSW	and economic instruments, such as EPR, continue to gain importance	
Public awareness	Waste management moves up the hierarchy of people's priorities as living standards increase	Resource and waste management increasingly become key issues in public debate and perception	• Inclusion of the public, not only in the debate, but also in the implementation of positive change
Cleanliness and the public image	The public image of the cities has been a driver propelled by the PILs during the late 1990s	Remains a key driver as a functional environmental infrastructure attracts (foreign) investment and can strategically position the country or a specific city on a global platform	• What is the definition of a 'clean' city? • How sustainable is cleanliness as a sole means to an end?
Business interest and profit motives		Emerged as a driver in the 2000s, accompanied by the ongoing privatisation of MSWM elements and the introduction of MSWM technologies	• Equalising of drivers • Increasing correlation between this driver and all other existing drivers, leading to a situation in which other key drivers are only relevant when also fulfilling a business interest
International cooperation and international finance institutions	Emerged as drivers in the wake of weak local drivers and institutions	Continue to be relevant drivers, attempting to fill in the gap of management commitment and ownership	• International agenda setting in the Indian MSWM context

Climate change	Increased importance as a driver for development of MSWM	• Landfilling biodegradable MSW • Increased methane production through decomposition of organic material in landfills is contributing to global warming
Circular economy	Circular economy aspects become increasingly important, with waste prevention and recycling being key priorities	• Lack of data on recyclables • EPR implementation across industries • Sustainable production and consumption • Waste prevention scheme

Source: Based on Wilson (2007), 204.

3.2. The Role of Development Drivers in India's Municipal Solid Waste Management Agenda Between 1986 and 2016

The period between 1986 and 2016 is marked by a variety of attempts and efforts by the Indian government to tackle the challenges related to the management of municipal solid waste. While the legislative framework sets the stage, committees and councils and their output in the form of reports attempt to establish some sort of understanding about MSW. In addition, there are official manuals and guidelines to support involved stakeholders to deal with the MSW challenge, while MSW initiatives aim to foster community participation. All these developments in India's political agenda setting for MSWM are driven by forces and mechanisms. The balance between the groups of drivers, which has varied in this period of thirty years, will be analysed in the following.

In order to establish a comprehensive picture and embed the developments after 1986 in a broader context, it is essential to look beyond and at the initiatives which were pushed by the government before 1986.[198] The initiatives by the GoI before 1986 mainly focused on promoting composting of MSW, which is justifiable, considering the fact that the share of the organic fraction in the overall generated MSW in India in the 1960s and 1970s amounted to up to 60 per cent of the overall share, while the share of recyclables was only around 5 per cent.[199] Thus, in the 1960s, the Ministry of Food and Agriculture offered soft loans to local bodies for promoting composting of urban solid waste. In addition, the fourth five-year plan from 1969 to 1974 provided grants and loans to state governments to set up composting facilities for biodegradable MSW.[200] The UN Conference on Human Environment held at Stockholm in 1972 and the Stockholm Declaration on the Human Environment published thereafter, had a significant impact on the constitution of India, as well as on the environment law framework, and lay the foundation for two of the key development drivers for India's waste management: the conference outcome underlines the inseparably related realms of a protected environment and human well-being as it states that "[t]he protection and improvement of the human environment is a major issue which affects the well-being of peoples and economic development throughout the world; it is the urgent desire of the peoples of the

198 Central Public Health & Environmental Engineering Organisation, "Report of the Technology Advisory Group on Solid Waste Management", (New Delhi: Ministry of Urban Development, Government of India, 2005), 3.
199 Institute of Hygiene and Public Health (IHPH), *Studies of Institute of Hygiene and Public Health*; Kaushal, Varghese, and Chabukdhara, "Municipal Solid Waste Management in India-Current State and Future Challenges: A Review", 1478.
200 Central Public Health & Environmental Engineering Organisation, "Report of the Technology Advisory Group on Solid Waste Management", 3.

whole world and the duty of all Governments."[201] Only few aspects related to the general topic of waste were touched upon in the conference outcomes: while the topics of marine litter handling and control, and recycling of wastes in agriculture were discussed, the challenges to waste disposal were addressed, and a designated priority area for research in relation to "(…) [w]ater supply, sewerage and waste-disposal systems adapted to local conditions, particularly in semi-tropical, tropical, Arctic and sub-Arctic areas (…)"[202] was highlighted. Indira Gandhi, the then Prime Minister of India, had participated in the conference, after which environment provisions were incorporated into the 42nd Constitutional Amendment Act which was passed in 1976. Since then, Article 48A part IV, 'Directive Principles of State Policy,' reads: "The State shall endeavour to protect and improve the environment and to safeguard the forests and wild life of the country."[203] While Article 51A(g), part IVA, 'Fundamental Duties,' reads: "It shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wild life, and to have compassion for living creatures."[204] Also, in the aftermath of the Stockholm conference, in 1974, the GoI introduced a modified scheme to revive urban waste composting in cities with a population over 300,000.[205]

It was in 1975 that the government broadened its perspective, as it formally recognised waste as an issue, especially in urban spaces: it was in this context that the GoI constituted the first high powered committee for a holistic review of urban waste problems. This committee, in its report, covered eight areas of waste management and made seventy-six recommendations.[206] Based on these recommendations and under the National Scheme of Solid Waste Disposal (1975–1980), ten mechanical composting plants with a processing capacity of 150 to 300 tonnes of MSW per day were set up throughout the country. The scheme focussed on cities with a population over three hundred thousand.[207]

The Bhopal gas disaster in December 1984 precipitated the passage of the Environment (Protection) Act (EPA), 1986. With exception of The Water (Prevention and Control of

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[201] United Nations, *Report of the United Nations Conference on the Human Environment* (United Nations, 1972) 3.
[202] Ibid., 7.
[203] Government of India, *The Constitution of India* (Government of India 1949) 48A.
[204] Ibid., 51A(g).
[205] Daniel Hoornweg, Laura Thomas, and Lambert Otten, "Composting and Its Applicability in Developing Countries", *World Bank working paper series* 8 (1999): 20.
[206] Central Pollution Control Board, *Parivesh. A News Letter Vom Envis Centre* (New Delhi: Ministry of Environment & Forests, 1997) 9.
[207] Talyan, Dahiya, and Sreekrishnan, "State of Municipal Solid Waste Management in Delhi, the Capital of India", 1277; Barkha Vaish, Abhijit Sarkar, Pooja Singh et al., "Prospects of Biomethanation in Indian Urban Solid Waste: Stepping Towards a Sustainable Future", in *Recycling of Solid Waste for Biofuels and Bio-Chemicals* (Springer, 2016), 7; Planning Commission, *Report of the High Power Committee. Urban Solid Waste Management in India* (New Delhi: Government of India, 1995).

Pollution) Act, 1974, and The Air (Prevention and Control of Pollution) Act, 1981, the previous laws were characterised as mainly human centric and not environment centric. Driven by the urgent need to prevent environment pollution and improve the overall environment, the EPA is environment centric, while embracing the protection of human well-being and public health.

3.2.1. Tapping into India's Waste Dimension (1986–1990)

The decisions around the EPA of 1986, which was notified by the then Ministry of Environment and Forests, "(…) were taken at the United Nations Conference on the Human Environment held at Stockholm in June, 1972 (…)."[208] Passed in March 1986, it came into force on November 19, 1986. The purpose of the Act is to implement the decisions of the United Nations Conference on the Human Environment. The EPA is an umbrella legislation designed to provide a framework for central government coordination of the activities of various central and state authorities under previous laws, such as the Water Act and the Air Act.

The objective of the EPA is to provide protection from different pollutants and to improve the environment. Moreover, it aims to prevent human beings, other living creatures, plants and property from hazards.[209] It gives the power of implementation and regulation to the central government. It is the primary legislation that must be considered and contains important provisions concerning the environment, which it defines as "(…) water, air and land and the inter-relationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organisms and property."[210] It states that human beings, other living creatures, plants, micro-organisms, property or the environment should be protected from any substance or preparation which, by reason of its chemical or physio-chemical properties or handling, is liable to cause harm.

While the EPA does not include the term 'solid waste' as such, it refers to a broader frame of environment and its 'environmental pollutant,' which is defined as "(…) any solid, liquid or gaseous substance present in such concentration as may be, or tend to be, injurious to environment (…)."[211] The aspect of environmental protection plays a significant role in the EPA, which builds the frame for future solid waste rules. The constitution of the National Waste Management Council (NWMC) in 1990 by the Ministry of Environment and Forests was an essential step towards building an institutionalised framework for waste. One main

[208] Ministry of Environment & Forests, "The Environment (Protection) Act, 1986", (New Delhi: Government of India, 1986).
[209] Ibid.
[210] Ibid., 2.
[211] Ibid., 2.

focus at that time was municipal solid waste management and advice on challenges related to MSW, including the incentives and disincentives in the context of MSWM.[212]

3.2.2. A Sanitation Crisis as a Kick-Off for a Focussed MSW Policy Approach (1991–1995)

In 1991, the MoEF established a labelling scheme for environment friendly products, called ECOMARK. Till date, ECOMARK is issued by the Bureau of Indian Standards (BIS) to products that are "(…) made, used or disposed in a way that significantly reduces the harm it would otherwise cause the environment (…)."[213] Two of the identified objectives of the certification mark is to "(…) provide an incentive for manufacturers and importers to reduce adverse environmental impact of products [and] to assist consumers to become environmentally responsible in their daily lives by providing information to take account of environmental factors in their purchase decisions."[214]

The beginning of the 1990s and the developments surrounding the relationship between men and the environment were globally characterised by the United Nations Conference on Environment and Development (UNCED), also known as the Earth Summit or the Rio Summit. This UN conference was held in Rio de Janeiro in June 1992, twenty years after the UN conference in Stockholm, and gave birth to UN conventions on climate change (UNFCCC), biodiversity and desertification, and to Agenda 21, a roadmap to sustainable development. In the UN conference in Stockholm, the topic of solid waste and related topics of consumption and production, recycling and disposal were merely peripheral topics or not touched upon at all, the Rio Conference put the issue of waste and waste management on the political agenda by making waste management and treatment one of the priorities in The Rio Declaration on Environment and Development (1992), and the action plan of the conference, Agenda 21. Although the Rio outcomes do not directly refer to the waste hierarchy concept, the mentioned recommendations are clearly connected to the concept of most and least favourable waste management and treatment options and the underlying life-cycle thinking.

> Governments should urge waste minimization and increased reuse/recycling as strategies toward sound waste treatment and disposal; encourage 'life-cycle' management of the flow of material into and out of manufacturing and use; provide incentives to recycling; fund pilot programs, such as small-scale and cottage-based recycling industries, compost

[212] Jona Razzaque, *Public Interest Environmental Litigation in India, Pakistan, and Bangladesh*, vol. 7 (Kluwer Law International, 2004), 146; Ministry of Environment & Forests, *Hazardous Waste: Special Reference to Municipal Solid Waste Management* (New Delhi: Government of India, 2001) 144-45.
[213] Ministry of Environment & Forests, "Ecomark", Government of India, http://envfor.nic.in/legis/others/ecomark.html (last accessed April 17, 2019).
[214] Ibid.

> production, irrigation using treated waste water, and the recovery of energy from wastes; establish guidelines for the safe reuse of waste and encourage markets for recycled and reused products.[215]

The specific attention given to environmentally sound management of waste increased awareness at the international level in regard to the topic itself and the four identified programme areas, "(…)[m]inimizing waste; [m]aximizing environmentally sound waste reuse and recycling; [p]romoting environmentally sound waste disposal and treatment; [e]xtending waste service coverage."[216] In retrospect, it is interesting that plastic, also a waste fraction in the MSW waste stream, and its looming future role in the global waste economy, was neither recognised nor addressed in the Rio Summit proceedings. India's NWMC, on the other hand, constituted a national plastic management task force in 1993 which aimed at the minimisation of adverse environment and health impacts resulting out of plastic recycling. In 1992, the then MoEF published a Policy Statement for Abatement of Pollution which laid emphasis on pollution prevention in place of end-of-pipe solutions, and aimed at laying down "(…) mass-based standards, which will set specific limits to encourage the minimisation of waste, promote recycling and reuse of materials, as well as conservation of natural resources, particularly water."[217] Hence, elements of the waste hierarchy concept had already found their way into the framing of the MSWM agenda in 1992. While the constitution and actions of the NWMC, as well as the MoEF's focus on waste minimisation and promotion of recycling, can indeed be interpreted as cornerstones in the government's realisation process and understanding of the challenges surrounding MSWM, it was eventually the outbreak of the epidemic in Surat which set in motion a whole a chain of developments the political agenda setting for MSWM. The then MoEF analyses the situation in Surat in a 2002 published case study report:

> The plague became an issue of global concern. Close to 200 deaths were linked to the outbreak. The disease created widespread panic and led to a mass exodus from the city. Apart from the human tragedy, it was a severe blow to not only Surat's economy which suffered a loss of several million rupees every day, but also to the nation's economy. The outbreak had an impact on industrial production, tourism, export, and many other areas. International flights to India were temporarily suspended, and export of food grains from Surat was banned.
>
> The precipitating factor for the outbreak of plague in Surat was constant rain which lashed the city for more than two months and led to flooding and large-scale water-logging in low-lying areas. The primary reason for this was the faulty drainage system. Hundreds of cattle and other animals died due to the flood and water-logging. The floods, in fact, only

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[215] United Nations, *The Rio Declaration on Environment and Development (1992)* (United Nations, 1992) 8.
[216] United Nations, *Agenda 21* (Rio de Janerio, Brazil1992) 254.
[217] Ministry of Environment & Forests, *Policy Statement for Abatement of Pollution* (New Delhi: Government of India, 1992) 6.1.

> brought to a crisis point the dangers inherent in inadequate waste management systems. (…)
>
> Environmental cleanliness became the paramount concern. Recognizing that a long-term plan was needed to sustain this initial momentum, in May 1995, the Government of Gujarat launched a major programme to clean up the city. This included a change in the personnel set-up of the Surat Municipal Corporation. Within one year, through a well-orchestrated strategy, the SMC increased the clearing of accumulated garbage from 50 percent per day at the time of the plague, to almost 94 percent of the 1,100 tonnes of garbage generated everyday. Primary importance was given to the monitoring, regulation and streamlining of garbage collection and disposal. An integrated approach was adopted towards sanitation, public health and garbage management.[218]

The outbreak in Surat reflected the continuous mismanagement of MSW in the country and the impacts of the same not only on the environment but especially on public health, which as a result became one of the key development drivers for municipal solid waste management in India. While the narrative in this MoEF case study very much highlights the public health issue in form of the human tragedy which had occurred, it also draws major attention to economic and public image concerns, Surat as a city and India as a country had to face in the aftermath of the Surat crisis.

Box 8: India's waste culture—An example from Surat

The aftermath of the Surat plague was characterised by a holistic restructuring of the approach to the city's MSWM system and the Surat Municipal Corporation, focussing on the increment of Surat's MSW collection rate and its proper disposal. Surat's municipal commissioner S. R. Rao, who was interviewed in 1996 by *Outlook* about his experiences after the plague, came up with multiple ideas for a more sustainable MSWM system in Surat. One of them was to set up a supervision system in which municipal officers would supervise sweepers and cleaners on a daily basis in order to maintain a clean city. The interview quotes Rao saying: "Apart from a feeling of camaraderie amongst my colleagues, this also helped us gain field reality: a sweeper can't ask a millionaire to remove the car hiding garbage or a hotel owner not to throw foodstuff on the roads."[219] This quote sums up the mind-set in relation to waste workers—without making a major difference between formal and informal waste workers—which is prevailing down to the present day. Meeting or communicating with a waste worker on an eye-to-eye level is rather rare, and, as seen in Rao's quote, a waste picker addressing someone from a different profession or economic

[218] Ministry of Environment & Forests, *Towards Sustainability - Learning from the Past, Innovating for the Future* (New Delhi: Government of India, 2002) 13–14.
[219] Shekar Ghosh, "Cleaning up the Plague City. Suryadevara Ramachandra Rao Gives Surat a New Look, Making It India's Second Cleanest City", *Outlook*, November 27, 1996, https://www.outlookindia.com/magazine/story/cleaning-up-the-plague-city/202600 (last accessed April 10, 2019).

background directly is almost impossible. Also, in the report on Solid Waste Management in Class 1 Cities in India, which was published by a committee constituted by the Supreme Court of India in 1999, expounds the problem of this categorisation of anybody working with waste:

> In most urban areas the management of urban wastes is looked at as an inferior function fit to be supervised only by the lower level of officers. The people at the helm of affairs do not consider SWM as a priority area though a very large percentage of funds of the urban local body is spent towards this most essential service. The apathy of the decision-makers and urban planners is thus primarily responsible for the poor level of SWM services in the urban areas.[220]

This quote underlines the huge disconnect between the relevance of a (management) task and the consideration of a task as being inferior, resulting in a gap of action and responsibility, which is very much visible in the Indian MSWM context.

Source: Author's own.

Subsequent to the Surat epidemic, the government became gradually more involved in MSWM: the Central Public Health Environmental Engineering Organization (CPHEEO) of the then Ministry of Urban Affairs and Employment (MoUAE) prepared a policy paper on promoting the integrated provisions of water, sanitation and solid waste management and drainage utilities in India; the MoEF and the CPCB organised an interaction in March 1995 with municipal authorities and other concerned ministries to evolve a strategy and master plan for the management of municipal solid waste; and the Ministry of Health and Family Welfare initiated a National Mission on Environmental Health and Sanitation.[221] The topic of MSW became more publicly debated, with the Federation of Indian Chambers of Commerce and Industry (FICCI) organising a stakeholder round table in June 1995 in New Delhi.[222] In 1995, the MoUAE engaged NEERI to develop a strategy paper on solid waste management in India, which was presented in August of the same year.[223] Moreover, realising the potential and the requirement, the then Ministry of Non-Conventional Energy Sources (MNES) launched the National Programme on Energy Recovery from urban municipal and industrial wastes. One focus in the programme was the promotion of adoption of appropriate technologies.[224] In the same year, the central government set up a 'High Power Committee

[220] Supreme Court of India, *Solid Waste Management in Class 1 Cities in India. Report of the Committee Constituted by the Hon. Supreme Court of India* (New Delhi: Government of India, 1999).
[221] Ministry of Environment & Forests, *Agenda 21 - an Assessment* (Government of India, 2002) Chapter 15; Planning Commission, *Report of the Taskforce on Waste to Energy 2014*.
[222] Gangawane and Khilare, *Sustainable Environmental Management: Dr. Jayashree Deshpande Festschrift Volume*, 158.
[223] National Environmental Engineering Research Institute, *Solid Waste Management in MCD Area*.
[224] Zhu, Asnani, Zurbrugg et al., *Improving Municipal Solid Waste Management in India: A Sourcebook for Policy Makers and Practitioners*, 62.

on Urban Solid Waste Management in India,' known as the Bajaj Committee as it was constituted under the chairmanship of Planning Commission member J.S. Bajaj to review urban solid waste management. Its report points out that:

> Urban Solid Waste Management (U.S.W.M.) continues to remain one of the most neglected areas of urban development in India. The sheer immensity of the problem, the financial and infra-structural constraints including non-availability of land for safe disposal of generated waste and the lack of awareness and apathy at all levels have come in the way of efficient, safe management of urban solid waste.

In addition, the report makes a number of recommendations, such as promotion and encouragement of source segregation of urban solid waste, which, according to the report, comprises "(....) household wastes, construction and demolition debris, sanitation residues, industrial and hospital wastes"[225], and community-based DTDC, with possible primary level collection by private agencies or NGOs and transportation with appropriate vehicles. Moreover, the recommendations mentioned the possible introduction of monthly user fees. After landfilling, composting is identified as the next preferential option of MSW disposal. In addition, the use of appropriate technology for waste treatment and disposal, and private participation in setting up pilot plants is being encouraged.[226] The Bajaj Committee report recognises the waste workers' contribution to the overall waste economy, especially in the recycling field, and stresses the need to organise them into cooperatives. It further highlights the need for informal workers to be integrated into the existing MSWM system.[227]

The report highlights the need for a comprehensive conceptual framework for environmental sanitation that must also include solid waste as population growth and pace of urbanisation, already escalating at that time, pose huge environmental challenges, especially for cities.

> The interactive interdependence of health, environment and sustainable development was accepted as the fulcrum of action under Agenda 21 at the Earth Summit at Brazil in 1992. The essence and essentials of health programmes include control of communicable diseases and reduction of health risks from environmental pollution and hazards. The interdigitation of primary environmental care and primary health care is therefore obvious, as is the substantial synergy that exists between poverty alleviation and environmental protection. While a governmental action can provide the much needed initial trigger, its further amplification depends upon the involvement of people, both individually and collectively as NGOs, who must assume the burden of civic responsibility which is the core requirement for a successful culmination of such endeavours.[228]

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[225] Planning Commission, *Report of the High Power Committee. Urban Solid Waste Management in India*, 2.
[226] Ibid., 4–5.
[227] Ibid., 5–6.
[228] Ibid., Preface.

While underlining the triangular relation and interdependence between the aspects of health, environment and sustainable development in the Preface of the report, J.S. Bajaj emphasises the core requirement of the involvement of the people in MSWM. Identifying the need for increased civic responsibility, the report puts the waste generator in charge of its produced waste and creates an essential understanding of ownership at the community level. This aspect stands in direct relation to the level of public awareness and the perception of MSW as something 'dirty' which should be removed from the field of vision. This aspect gets attached to institutional limitations, when the report concludes by saying

> Municipal solid waste management is looked upon as a job of municipalities and not as a collective responsibility where every citizen, voluntary organization, private entrepreneurs should play an appropriate role. Many urban areas do not have an appropriate structure to look after the Solid Waste Management. Multiple agencies are involved; there is very little coordination between agencies. They lack technical know how and need training support. The existing laws for solid waste management in the cities are neither adequate nor effectively enforced.[229]

The requirement of ULBs to create a solid waste management cell or an overarching agency is being emphasised in order for different activities of the various involved stakeholders to be coordinated.

> It is essential that coordination of the activities required for proper management of urban solid waste is entrusted to one Agency/Cell. This Cell can be located in any of the concerned Ministry and should coordinate and oversee the solid waste management activities (…).[230]

The report addresses the challenges related to India's MSWM at that time on a variety of levels. Development drivers were confronted with additional forces, thus creating a new balance of drivers. Until the Surat epidemic, public health and environmental protection were the main development drivers for solid waste management in India. The recommendations of the Bajaj report feed into the established key development drivers of public health and environmental protection, and by encouraging public–private partnerships in MSWM, builds the ground for business opportunities as a driver for MSWM. By finally touching upon lack of ownership, lack of institutional responsibility, and lack of public awareness and the related consequences, the report puts emphasis on a mix of different drivers—environmental protection, public health, business interests and profit motives, good governance, public awareness, public image and ownership—as relevant development drivers for the political agenda setting in relation to municipal solid waste management. The Surat case study, which was published by the then MoEF in 2002, underlines the shift in perception which had occurred

[229] Ibid., 8.
[230] Ibid., 9.

in the years after the Surat epidemic: the epidemic was not merely considered a health and environment crisis, but a public image and economy crisis with nationwide consequences which, at the same time, contains business opportunities.

3.2.3. Paving the Way for India's First Municipal Solid Waste Management Rules (1996–2000)

Increased public awareness and enhanced civic responsibility in relation to solid waste management were two essential elements of the Bajaj Committee report and were identified as core requirements for successful waste management systems. Just after the publication of the report in 1996, it was exactly this civic engagement and citizen participation that had ground breaking impacts on the then status quo of India's political agenda in regard to MSWM.

The countrywide sanitation crisis, which were manifested especially by the cholera and gastroenteritis epidemics in Delhi, were followed by protests and PILs that demanded that the state improve solid waste management.[231] Many PILs at the time were driven by environmental and health concerns, such as *B. L. Wadhera versus Union of India and others,* and *Almitra Patel versus the Union of India and others*, both from 1996. In *Wadhera*, the plaintiff, B. L. Wadhera, demanded, as mentioned earlier, an improvement in Delhi's municipal solid waste management situation, as the responsible ULBs were "(…) wholly re-miss in the discharge of their duties under law."[232] This petition and the debates surrounding it paved the way for a further shift towards free market involvement and business opportunities, as it "(…) drew unwelcome attention to under-performance by public bodies (…) and, by the same token, ratcheted pressure on Delhi's municipalities to find new answers to the city's compounding waste. Privatisation of waste handling became a real possibility for the first time."[233] Almitra Patel petitioned for hygienic solid waste management, and filed her PIL in the Supreme Court against every state and union territory, the government of India, the CPCB and ten worst cities.[234] The PILs led to the setup of various expert committees at national and city level[235] In 1996, the GoI initiated the National Slum Development Programme (NSDP), whose objective was the upgradation of urban slums by providing physical amenities. One objective of the programme was the provision of solid waste management in slums. The NSDP was later subsumed under the Jawaharlal Nehru Urban Renewal Mission (JNNURM) and was

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[231] Ghosh, *Solid Waste Management in Delhi: An Exploratory Study on Local Government-Community Interface*, 14; Schindler, Demaria, and Pandit, "Delhi's Waste Conflict".
[232] *Dr. B.L. Wadehra Vs. Union of India and Others, 1996 Scc (2) 594, Jt 1996 (3) 38*, 1.
[233] Chaturvedi and Gidwani, "The Right to Waste: Informal Sector Recyclers and Struggles for Social Justice in Post-Reform Urban India", 135.
[234] Almitra Patel, "Almitrapatel", almitrapatel, http://www.almitrapatel.com/mylife.htm (last accessed April 10, 2019).
[235] National Environmental Engineering Research Institute, *Solid Waste Management in MCD Area.*

discontinued in the mid 2000s.[236] In 1996, the then Ministry of Non-Conventional Energy Sources (MNES) launched a waste-to-energy pilot programme, the National Programme on Energy Recovery from Urban and Industrial Wastes, promoting the utilisation of wastes for recovery of energy through creating suitable conditions.[237]

Acting on the *Patel* petition, in January 1998, the Supreme Court constituted another expert committee, the Asim Burman Committee, to examine all the aspects of waste management for Class I cities.[238] The committee was formed under the Supreme Court of India to identify deficiencies and make recommendations to improve solid waste management. The final report, Solid Waste Management in Class 1 Cities in India, Report of the Committee constituted by the Hon. Supreme Court of India, submitted in 1999, outlined problems, and prognoses, and included recommendations advocating simple technologies such as composting, easily achievable standards, and a time frame for compliance. "On the basis of this report, the Supreme Court directed the government of India, state governments and municipal authorities to take necessary action."[239]

One of the mandatory recommendations of the report underlines the importance of segregation and storage of recyclables and biodegradables at source, while at the same time keeping in mind the essential role of waste workers:

> The local body may mobilise NGOs or co-operatives to take up the work of organising street rag pickers and convert them to door step 'waste collectors' by motivating them to stop picking up soiled and contaminated solid waste from the streets, bins or disposal site and instead improve their lot by collecting recyclable clean material from the doorstep at regular intervals of time. The local bodies may, considering the important role of rag pickers in reducing the waste and the cost to the local body in transportation of such waste, even consider extending financial help to NGOs and co-operatives in providing some tools and equipment to the rag pickers for efficient performance of their work in the informal sector.
>
> The Local Bodies may actively associate resident associations, trade & Industry associations, CBOs and NGOs in creating awareness among the people to segregate recyclable material at source and hand it over to a designated waste collector identified by the NGO. The local body may give priority to the source segregation of recyclable wastes by shops and establishments and later concentrate on segregation at the household level.
>
> The upgraded rag pickers on becoming door step waste-collectors, may be given an identity card by the NGOs organising them so that they may have acceptability in society. The local body may notify such an arrangement made by the NGOs and advise the people to cooperate.

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[236] Ministry of Environment & Forests, *Agenda 21 - an Assessment*, Chapter 15.
[237] Central Public Health & Environmental Engineering Organisation, "Report of the Technology Advisory Group on Solid Waste Management", 41.
[238] Class I cities are defined as cities with 100,000 or above inhabitants.
[239] Zhu, Asnani, Zurbrugg et al., *Improving Municipal Solid Waste Management in India: A Sourcebook for Policy Makers and Practitioners*, 11.

> This arrangement could be made on 'no payment on either side basis' or people may, negotiate payment to such waste collectors for the door step service provided to sustain their efforts.[240]

Recognising the role of waste workers in the overall system, as well as understanding their potential in the context of collection and their contribution to recycling when nurtured properly, is a core recommendation of the report. Addressing their lack of acceptability in society adds another layer to this understanding, which highlights the importance of public awareness and inclusivity as drivers for MSWM, while at the same time recognising the resource value of waste as a key driver. This understanding connects with what was established by the Bajaj Committee outcomes, in which cooperation with waste workers was encouraged. In retrospect, the consideration towards waste workers was given a fillip with the Solid Waste Management in Class 1 Cities in India report, which formed a constructive basis for further discussion about possible cooperation, collaboration or integration of all involved stakeholders. But it was another key recommendation of the report that was to create a stir in the course of the following political processes—to enable private sector participation in MSWM:

> The Committee has suggested amendments in State laws needed to make solid waste management practices effective and has also suggested to the Govt. of India to keep the SWM services outside the purview of the Contract Labour (Regulation & Abolition) Act 1970, so as to enable public private partnerships and private sector participation in selected areas of Solid Waste Management for improving the quality of life in urban areas.[241]

This recommendation therefore can be seen as a direct response to developments which had been set in motion by the Bajaj Committee report and continued with the 1996 PILs. While the Bajaj Committee report encouraged private participation in SWM, the debates surrounding the 1996 PILs provided a platform and opened the door for formal private sector participation. By propagating an enabling framework for public private partnerships and private sector participation in elements of MSWM, the committee consolidated the shift towards privatisation of SWM in India.[242]

In 1999, the central government notified the Recycled Plastics Manufacture and Usage Rules, 1999, under the Environment (Protection) Act, 1986, to regulate the manufacture, sale, use and recycling of plastic bags. The rules specify that recycled plastic shall not be used in producing bags, sacks or wrapping used in food packaging, and that recycled plastic containers shall be clearly labelled, indicating the recycling process. The rules further regulate that food shall be packed only in virgin plastic and mention specifications about thickness

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[240] Supreme Court of India, *Solid Waste Management in Class 1 Cities in India. Report of the Committee Constituted by the Hon. Supreme Court of India*, Chapter 3.2.
[241] Ibid., 5.
[242] Ministry of Environment & Forests, *Agenda 21 - an Assessment*, Chapter 15.

and marking of plastic packaging. Moreover, the rules place a strong emphasis on recycling plastics in accordance with The Guidelines for Recycling of Plastics which were published by the Bureau of Indian Standards in 1998.[243]

The Municipal Solid Waste (Management and Handling) Rules, 2000, notified by the GoI on September 25, 2000 under the provisions of the EPA 1986, was a direct response to the Supreme Court Committee Report on Solid Waste Management in Class 1 Cities in India, 1999. As a result, it was directly connected to the *Almitra Patel v. the Union of India* PIL, with Almitra Patel adding to the first set of rules. The MSW Rules, 2000, are therefore the result of a six-year-long journey, which began after the sanitation crises in Surat and Delhi.[244] To ensure compliance, some of the major recommendations of the Asim Burman Committee have been incorporated in the Municipal Solid Waste (Management and Handling) Rules, 2000, leading to the transformation of waste management in India.

The MSW Rules, 2000, issued by the MoEF, play a central role in determining how waste is collected, segregated, stored, processed and disposed of in Indian cities. The rules define MSW as "(…) commercial and residential wastes generated in municipal or notified areas in either solid or semi-solid form excluding industrial hazardous wastes but includes treated bio-medical wastes."[245] It includes household garbage and rubbish, street sweeping, construction and demolition debris, sanitation residues, non-hazardous industrial refuse and treated bio-medical solid wastes. The rules identify a variety of actors responsible for different elements of the MSWM system. Accordingly, the urban development departments of the respective state governments are responsible for enforcing the provisions of the rules in metropolitan cities, while the district magistrates or deputy commissioners of the concerned districts are responsible for enforcing the provisions within the territorial limits of their jurisdictions. Every municipal authority is responsible for collection, segregation, storage, transportation, processing and disposal of municipal solid wastes. The SPCBs are responsible for monitoring compliance with air, water and noise pollution standards. They must also monitor compliance with compost quality and incineration standards as specified in the rules. The rules identify the CPCB as the agency that will monitor the overall implementation of these rules, and municipalities will be required to submit to the CPCB annual reports

[243] Ministry of Environment and Forests, "The Plastics Manufacture, Sale and Usage Rules, 1999", (New Delhi: Government of India, 1999).
[244] Schindler, Demaria, and Pandit, "Delhi's Waste Conflict".
[245] Ministry of Environment & Forests, "Municipal Solid Wastes (Managment and Handling) Rules, 2000", 3. XV.

regarding municipal waste management in their areas.[246] While the functions of the involved stakeholders have not been outlined in detail, some stakeholders, like the MoUD, have not been addressed at all, which makes the enforcement of rules as well as the monitoring of rules by the various bodies challenging. The rules therefore fail to attend to issues surrounding ownership or institutional responsibility and good governance. In addition to this, if one considers municipal solid waste to be a product, which is mainly impacted and shaped by the input of three contributors—the manufacturer, the consumer and the recycler—then it is exactly these contributors who have hardly been addressed in the rules: The only mandate that has been formulated in terms of the waste generator is that it "(…) shall be the responsibility of generator of wastes to avoid littering and ensure delivery of wastes in accordance with the collection and segregation system (…)"[247], which raises the question of how this mandate of avoiding littering by the waste generator can be ensured. Apart from that, no other specific duties have been assigned to the waste generator, which leaves a huge gap at the waste source and creates a gap especially in terms of required public awareness. The rules do not assign any duty to the producer or recycler and do not incorporate incentives and penalty fees to waste generators and recyclers, leaving all three ends very loose in terms of responsibility, ownership and consistency in acting according to the given rules.

The rules address all stages of MSWM from collection to disposal. The main observations in this research are related to the levels of MSW collection, segregation and processing. At the collection level, the rules emphasise door-to-door collection and encourage segregation of waste at source. What is not mentioned, however, is how to combat the existing lack of awareness and manpower constraints for door-to-door collection. Further, the rules make it mandatory for ULBs to arrange for disposal, but the rules do not make it mandatory for the ULBs to collect the MSW from the *dhalao*, which leaves a loophole in implementation.

At the segregation level, the rules emphasise the need to create awareness at the community level for segregation and the need to promote recycling and reuse, but they do not acknowledge the role of the informal sector. The informal workers, who play an essential part in collection as well as segregation, and therefore contribute to recycling, are completely neglected in the rules. When analysing the different government documents, it becomes evident that although a variety of sources claim that the major recommendations of the Asim Burman Committee had been incorporated in the MSW Rules, 2000, some of the essential recommendations, from both the Bajaj report as well as from the Asim Burman Committee

[246] Ministry of Environment & Forests, *Hazardous Waste: Special Reference to Municipal Solid Waste Management*; Ministry of Environment & Forests, "Municipal Solid Wastes (Managment and Handling) Rules, 2000".
[247] Ministry of Environment & Forests, "Municipal Solid Wastes (Managment and Handling) Rules, 2000", 896.

report, have been neglected when phrasing the MSW Rules, 2000. Considering the fact that the outcomes of both committees acknowledged the important contribution of informal workers in the context of MSWM, it is surprising that waste workers are not even mentioned once in the MSW Rules, 2000.

The MSW Rules, 2000, address the processing stage by emphasising the need to segregate waste in order to compost and recycle. While the rules highlight the need to adopt suitable technologies to minimise the burden on the landfill, they do not create an enabling framework for composting as a treatment option, for instance, as they do not include promotion of marketing of composting. That the rules neglect the existence and importance of waste workers also becomes evident at the processing stage where the rules mention authorisation requirements for setting up waste treatment facilities which clearly exclude waste workers.[248]

The MSW Rules, 2000, have laid down a strict timetable for compliance with a time span of a maximum of three years to improve the existing landfill sites, identify landfill sites for long-term future use, make them ready for operation, and set up waste processing and disposal facilities with provision of a buffer zone around such sites. At the same time the rules do not include assessment on quantity of waste generation or projections how it will increase or how the composition will change.

In 1998, at the same time as the Asim Burman Committee was constituted, the MoUD constituted an expert committee to prepare a user manual to be published together with the MSW Rules, 2000. The CPHEEO under the MoUD developed this guidance manual on MSWM for ULBs, to "(…) provide operational guidelines for the efficient municipal solid waste management systems"[249] in urban areas, and published it simultaneously with the MSW Rules, 2000. By introducing best methods to manage MSW which are derived from the hierarchy of the waste management concept, the manual establishes the resource value of waste as a driving force for MSWM. It acknowledges that "[t]he proper disposal of urban waste is not only absolutely necessary for the preservation and improvement of public health, but it has an immense potential for resource recovery."[250] In addition, the manual picks up on the recommendation which had been introduced in the Bajaj report: to establish an MSW umbrella institution in order to manage MSW in a consolidated way. By addressing the lack of coordination and passing on responsibilities among involved stakeholders, the manual places a strong emphasis on the need for institutional responsibility and the lack of it. Moreover,

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[248] Ibid.
[249] Central Public Health & Environmental Engineering Organisation, *Manual on Municipal Solid Waste Management* (New Delhi: Ministry of Urban Development, Government of India, 2000) 3.
[250] Ibid., 2.

the manual reflects on the introduction of economic instruments, such as the provision of penalty charges for waste generators and EPR, both aspects which are not part of the MSW Rules, 2000.[251] The lack of community awareness and the need to create it in order to overcome poor waste management is yet another aspect which is discussed in the manual and only finds little attention in the MSW Rules, 2000 itself.[252]

One outstanding fact is that the manual not only recognises the spearheading role of informal workers, but also acknowledges that, even though informal workers often do not have the "(…) technology to process or recycle (…)"[253], certain waste material in an adequate way, and a structural readjustment, especially in the recycling sector, is required "(…) it must also be ensured that the persons already engaged into the trade are protected in terms of their livelihoods, which calls for a gradual and incremental approach."[254] This fact has been neglected in the MSW Rules, 2000. A common theme throughout the simultaneously published documents, however, is the promotion of private sector participation in elements of MSWM. This encouragement led to profit motives and business interests becoming a key development driver for India's MSWM.

3.2.4. The Business of India's MSWM in a Globalised World (2001–2005)

The recommendations of the Asim Burman Committee report and the incorporation of the same in the first Municipal Solid Waste (Management and Handling) Rules, 2000, set the scene for an enabling framework for increased formal private sector participation in MSWM. The years after 2000 can be characterised by the impact of this continuous process of privatisation of selected MSWM elements on the one hand, and by the government's decision-making against the backdrop of globalised environment discussions on the other. In 2002, The World Summit on Sustainable Development (WSSD) took place in Johannesburg, South Africa. Prior to the event, the MoEF published a retrospective documentation on the India's achievements in the implementation of the Rio Agenda 21, Agenda 21—An Assessment, in which the ministry analyses the status quo of India's resources, economics, governance and social profile, to then reflect on the achievements and initiatives related to environmental, economic and social facets of Agenda 21. In its assessment, the MoEF expresses its concerns in relation to solid waste management in urban areas when stating:

[251] Ibid., 429–32.
[252] Ibid., 2.
[253] Ibid., 161.
[254] Ibid.

> Owing to the limited availability of finance and infrastructure none of the municipalities seem to be in a position to meet the deadlines for setting up waste processing and disposal facilities. Due to budgetary constraints, inadequate equipment and poor planning, house-to-house collection of wastes by local bodies is very rare. Inspite of rules & regulations and decentralized decision-making in urban services, the collection efficiencies still range on an average from 50 to 90% of the solid waste generated, leaving the balance unattended (CPHEEO Manual, 2000). The average expenditure on solid waste collection in most class I cities is around 75% of the total expenditure on this service as per 1997–98 figures. This leaves little money for disposal activities making these services inefficient (NIUA, 2000). This percentage rises to around 85% in class II cities. The budget allocation for disposal of solid waste remains at 10-15% of the total expenditure on this service, insufficient to ensure proper disposal (NIUA, 2000).[255]

While the assessment stresses the municipality's inefficiency and financial and infrastructural constraints, it also comes up with a strategy for improving the effectiveness of local governance and provision of basic services in urban areas:

> Most local bodies find it difficult to incur heavy capital expenditure in improving solid waste collection, transportation, and disposal systems. Given the resource constraints of the local bodies, the private sector should be encouraged as much as possible. Experience in India suggests that cost savings are possible by involving the private sector in solid waste management. (…) Considering the high cost involved in waste management, the first priority of the local bodies, even in the case of privatization should be waste minimization at source. To facilitate this, awareness generation programmes should be undertaken to ensure the active participation of citizens. [256]

The given strategy claims that formal private sector involvement in MSWM is essential in order to cope with existing resource constraints of municipalities. At the same time, this strategy puts waste minimisation first, which the MoEF believes is the responsibility of citizens. Building on aspects of the driver of public awareness, the assessment neither explains how to implement these awareness generation programmes, nor does it mention industry responsibility when talking about waste minimisation; it is questionable just how far the citizen can be made solely responsible for minimising waste.

Also, the WSSD had a focus on solid waste, as attention was given to the environmentally sound management of waste, and the shift to sustainable consumption and production. The WSSD addressed the way societies produce and consume goods and services and called for a fundamental change in the same. The Report of the World Summit on Sustainable Development calls for action to "[p]revent and minimize waste and maximize reuse, recycling and use of environmentally friendly alternative materials, with the participation of government

[255] Ministry of Environment & Forests, *Agenda 21 - An Assessment*, Chapter 15.
[256] Ibid.

authorities and all stakeholders, in order to minimize adverse effects on the environment and improve resource efficiency (…)."[257]

Actively participating in the international debates surrounding environmental issues, such as climate change, in 2004 the MoEF published India's Initial National Communication to the United Nations Framework Convention on Climate Change, 2004, in which it addresses India's climate change related circumstances, analysing data and data gaps, as well as constraints and conditions related to India's impact on climate change. With its main focus on greenhouse gas emissions in a variety of sectors, the report also highlights the circumstances surrounding MSW in India. "The disposal of waste and the processes employed to treat these wastes give rise to GHG emissions. The two main sources of GHGs from the waste sector in India are municipal solid waste disposal and waste-water handling for commercial and domestic sectors."[258] Apart from emphasising the requirement for a sustainable MSW data collection system[259] since "(…) details about annual municipal solid waste generation, collection, dumping and dumpsite characteristics are not available beyond five to 10 years for even the large metropolitan cities (…)",[260] the report neither addresses potential MSW treatment options and their additional impact on climate change, nor privatisation of MSWM elements.

In 2005, the MoUD published the Report of the Technology Advisory Group on Solid Waste Management.

> Looking at the pathetic situation of solid waste management practices being adopted by Urban Local Bodies in the country (…), the Hon'ble Supreme Court of India had been seized with the problem and directed the Ministry of Urban Development & Poverty Alleviation to constitute a National Technology Mission (…) for improving the solid waste management practices in the country within a period of 5 years.[261]

The report covers a variety of topics, from India's MSWM past initiatives, to MSW treatment technologies and their applicability in India, to financial aspects of MSWM, to private sector participation in MSWM. While the report recommends that local bodies introduce private sector participation in order to deal with waste, it also underlines that:

> It must be noted that private sector participation cannot be used as a panacea for all problems. In order to attract private sector in service aspects such as collection and transportation or landfill site management, ULBs will have to put their house in order. (…) The present capacity of municipalities in India to manage the privatization process varies

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[257] United Nations, *Report of the World Summit on Sustainable Development. Johannesburg, South Africa, 26 August - 4 September 2002* (New York: United Nations, 2002) 19.
[258] Ministry of Environment & Forests, *India's Initial National Communication to the United Nations Framework Convention on Climate Change* (New Delhi: Government of India, 2004) 35.
[259] Ibid., 52–53.
[260] Ibid., 205.
[261] Central Public Health & Environmental Engineering Organisation, "Report of the Technology Advisory Group on Solid Waste Management", Preface.

> across cities and there is a clear need for developing in-house financial and managerial capacity. Further, monitoring of private sector is important, since the onus of ensuring proper service delivery and standard compliance, remains with the local body.[262]

It goes on to also highlight the risks involved in adopting waste treatment technologies:

> Local bodies are cautioned to adopt expensive technologies of power generation, fuel pellatization, incineration, etc., until they are proven under Indian condition [sic]and Government of India or expert agencies nominated by Government of India advises cities for adopting such technologies. (…) A careful assessment has to be made in each specific case before deciding upon any particular option, duly taking into account the available waste quantities and characteristics and the local condition.[263]

While surely underlining the aspect of privatisation in its report, the MoUDs taskforce also highlighted the involved risks, especially in relation to technologies. Later in 2005, the same ministry launched the Jawaharlal Nehru National Urban Renewal Mission, a reform-driven infrastructure improvement programme aimed to provide infrastructure facilities in all urban areas, including for solid waste management. The programme was meant to improve the quality of life and infrastructure in cities, while highlighting the aspect of health throughout its narrative. In order to bring about this urban transformation, active participation was sought from state governments and ULBs. The mission's aim was to be achieved by a strategy of upgrading the social and economic infrastructure in cities, provision of Basic Services to Urban Poor (BSUP), and wide-ranging urban sector reforms to strengthen municipal governance in accordance with the 74th Constitutional Amendment Act, 1992. The scheme was officially inaugurated by Prime Minister Manmohan Singh on December 3, 2005 for a seven-year period, up to March 2012, covering sixty-three cities across India, and was extended for another two years till March 2014. One of the projects under JNNURM was solid waste management. The focus was on establishing integrated systems that include segregation, collection, transport, processing, treatment and disposal of MSW. One of the main objectives was to incentivise state governments and ULBs to pursue reforms to improve the urban governance structure, with a major focus on setting up public-private partnerships (PPPs) to tackle the challenge of waste management. These privatisation processes that unfolded during the years when JNNURM was ongoing lead to a situation in which waste workers were displaced in multiple cities and found themselves out of work—for example, as door-to-door collection got increasingly privatised.[264]

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[262] Ibid., 54.
[263] Ibid., 18–20.
[264] Moyna, "Municipalities Get Thumbs Down on Solid Waste Management", *Down to Earth*, September 17, 2015, https://www.downtoearth.org.in/news/municipalities-get-thumbs-down-on-solid-waste-management-38898 (last accessed April 10, 2019).

> Structurally, ongoing urban transformations have prompted the emergence of new forms of rule and resource allocation and sharpened struggles over 'the right to the city'. In India, initiatives such as the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) have become the public face of the New Economic Policy (NEP) in urban areas. While it is too early to assess the net impact of JNNURM, it is increasingly clear that Indian cities have become battlegrounds around questions of 'the right to the city'.[265]

By providing a framework for PPPs and encouraging and incentivising ULBs to enter this setting, the JNNURM manifested India's shift towards the privatisation of MSWM.

Another output of the MoUD which was published in 2005 was the Status of Water Supply, Sanitation and Solid Waste Management study, which was funded by the MoUD and CPHEEO and carried out by the National Institute of Urban Affairs (NIUA). This study assesses the status and requirements of water supply, sanitation and solid waste management in selected 300 cities. The study draws certain conclusions in all three sectors and gives specific recommendations for a way forward. While underlining the serious health and environment implications an improper MSWM system can cause, the study has these recommendations for waste management:

> Three 'R's of solid waste management i.e. reduce, reuse and recycle must be adopted by all urban centres. This will help in reducing the quantum of solid waste that the local governments have to deal with. (…) waste treatment such as neighborhood composting and recycling of waste must be encouraged. Private sector participation must continue to be encouraged in this sector to achieve efficiency of operations and cost reduction. However, monitoring of privatised activities should be improved in order to provide better quality of services to the people.[266]

As opposed to JNNURM, this study stresses the resource value of waste by promoting the adoption of 3R in order for ULBs to be in a position to reduce the overall amount of waste that needs to be dealt with. In addition, the study underlines the importance of composting. While it emphasises the relevance of private sector participation, the study also promotes a stricter monitoring of the activities of private sector companies.

While this time period was certainly driven by business interests and the promotion of private sector participation, it was also shaped by the government's awareness of the limitations of ULBs in regard to MSWM and the need for a quick fix, which led the government to turn towards the introduction of new technologies. All these developments took place in the presence of the ongoing international climate change debate, in which India played and continues to play an essential role.

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[265] Chaturvedi and Gidwani, "The Right to Waste: Informal Sector Recyclers and Struggles for Social Justice in Post-Reform Urban India", 131.

[266] National Institute of Urban Affairs, *Status of Water Supply, Sanitation and Solid Waste Management* (New Delhi: Ministry of Urban Development, Government of India, 2005) 6-7.

3.2.5. Continuous Environmental Degradation and Who Is to Be Made Responsible (2006–2010)

India's MSWM policy agenda in the period between 2006 and 2010 is driven and impacted by multiple factors and mechanisms. The National Environment Policy (NEP), 2006, by the MoEF, for example, incorporates a variety of historic development drivers for improved municipal solid waste management, as well as some of the more recent drivers. The NEP aims at mainstreaming environmental concerns into all developmental activities. It emphasises conservation of resources and points out that the best way to aid conservation is to ensure that people dependent on resources obtain better livelihoods from conservation and not from degradation of resources. One aim of enhancing and conserving environmental resources is pollution abatement with a focus on MSW. It argues that environmental degradation often leads to poverty and poor health outcomes among populations and identifies drivers of environmental degradation.[267]

> The proximate drivers of environmental degradation are population growth, inappropriate technology and consumption choices, and poverty, leading to changes in relations between people and ecosystems, and development activities such as intensive agriculture, polluting industry, and unplanned urbanisation. However, these factors give rise to environmental degradation only through deeper causal linkages, in particular, institutional failures, resulting in lack of clarity or enforcement of rights of access and use of environmental resources, policies which provide disincentives for environmental conservation (and which may have origins in the fiscal regime), market failures (which may be linked to shortcomings in the regulatory regimes), and governance constraints.[268]

While the drivers of health and environmental protection are dominant throughout the policy, in relation to municipal solid waste, the policy also leans on development drivers of the resource value for waste, the drivers of institutional responsibility, business interests, public awareness and elements of circular economy. The action plan points out the need for the development and effective monitoring of public-private partnerships, strengthening the capacities of local bodies for segregation, recycling, and reuse of MSW, and giving legal recognition to and strengthening the informal economy involved in MSWM.[269] While the recognition of the role of informal waste workers in a policy was a first and very welcome, it also provoked critique.

> This policy of neglect by state and civil society actors toward informal sector recyclers has resulted in a farcical situation where the latter, having waited years for official recognition

[267] Ministry of Environment & Forests, "National Environment Policy 2006", (New Delhi: Government of India, 2006), 4.
[268] Ibid.
[269] Ibid., 39.

> of their livelihood rights, were finally granted it—through the National Environment Policy of 2006, under the sub-theme of 'soil pollution'![270]

When stressing the high potential of waste as a resource and the need to adopt clean technologies in order to "(…) minimize the generation of waste streams in the production processes and utilize waste from other consumption goods and production processes, rather than treating the waste after generation"[271], the policy underlines relevant aspects of the circular economy.

Despite the inclusive approach the MoEF tried to take in its NEP, the Audit on Municipal Solid Waste in India by the Comptroller and Auditor General of India (CAG), published in 2008, was sobering in almost all aspects, which were picked up in the NEP. Twenty-four states were included in the audit to identify loopholes and weaknesses in the policies related to management of waste. The audit revealed several gaps and defined recommendations for the MoEF, CPCB, states and municipalities, addressing issues such as incomplete data on waste generation, non-compliance of existing rules, ineffective monitoring, mismatch and gap in responsibility and accountability, and lack of ownership—all leading to ineffective waste management in the country.[272]

> Despite being a signatory to Agenda 21 (…) waste management efforts in India were not directed by a clear-cut policy. The '3 Rs' model indicating the waste hierarchy of reducing, recycling and reusing waste has not been replicated. Instead, the focus has been on disposal of waste being generated. MoEF had also not adequately promoted the use of recycled and environmentally friendly products through its environment education, consumer information and environment labelling programmes. (…) also (…) there appeared to be an absence of a single body taking ownership of waste issues in India. Further, there was no clear identification of bodies for monitoring of waste rules at the Central Government level, which caused a mismatch/gap in responsibility and accountability and led to the rules for management of waste being rendered ineffective. [273]

The report stressed that the environment labelling programmes were not adequately promoted. It states that the "(…) implementation of MoEF's environment labelling programme called 'ECOMARK' was tardy as 'ECOMARK' was granted to only three product categories ever since the programme was introduced in 1991"[274], and recommends that the "MoEF should include more products under the "ECOMARK" scheme and monitor adherence to environmental standards of these products [and] it should also prescribe standards for

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[270] Chaturvedi and Gidwani, "The Right to Waste: Informal Sector Recyclers and Struggles for Social Justice in Post-Reform Urban India", 135.
[271] Ministry of Environment & Forests, "National Environment Policy 2006", 46.
[272] Comptroller and Auditor General of India, *The CAG Audit on Municipal Solid Waste in India.*
[273] Ibid., 1.
[274] Ibid., 3.

classifying products as environmentally friendly (…)"[275] The CAG further called for an administrative reform in order to implement the waste management rules, implement the waste hierarchy concept, minimise waste generation, and protect public health and the environment according to Agenda 21. Highlighting the urgent need to adopt the waste hierarchy concept in the Indian MSWM context is a recognition of the requirement of a transformative shift towards a circular economy and the existing lack thereof.

In this phase, the relevance of climate change continued to grow in the Indian debate: the government constituted a high-level advisory group on climate change in 2007, which published a national action plan on climate change in 2008. "Recognizing that climate change is a global challenge (…)"[276], the Prime Minister's Council on Climate Change published the National Action Plan on Climate Change (NAPCC) in 2008. The action plan outlines a number of steps to mitigate and adapt to climate change and simultaneously advance India's development and climate change-related objectives. The NAPCC encompasses a range of measures and is implemented through eight missions. One of these, the National Mission in Sustainable Habitat, focuses on the improvement of energy efficiency in buildings, public transportation and management of solid waste, while it puts an emphasis on recycling.[277] In the climate change debate, the government therefore puts a strong emphasis on the need to "(…) not only promote sustainable production processes, but equally, sustainable lifestyles (…)."[278] The mission plan outlines a special focus on the development of technology for producing power from waste, while at the same time clearly stating that "MSW operations cannot be financially viable [and] ULBs should not expect to realize net royalties for treatment and disposal of MSW (…)."[279] While the mission plan acknowledges potential benefits of public-private partnerships, it also states that "(…) it is imperative that municipal finances are placed on a sound footing prior to outsourcing (…)"[280] MSW operations. In regard to recycling, the action plan points out that "India already has a significantly higher rate of recycling of waste compared to developed countries."[281] This assertion is questionable when considering that the overall MSW generation data, let alone the recycling figures—due to the involvement of informal waste workers in this process— are at the very least inconsistent. The technical aspect of the action plan recommends that the "(…) MSW Rules should be

[275] Ibid., 4.
[276] Prime Minister's Council on Climate Change, *National Action Plan for Climate Change 2008*, 1.
[277] Ibid.
[278] Ibid., 1.
[279] Ibid., 29.
[280] Ibid.
[281] Ibid., 3.

revised to focus (…) on performance or outcome norms that are to be met irrespective of particular systems and procedures, or technologies. This would provide benchmarks for monitoring and enforcement, as well as give space for innovation (…)."[282] The action plan further refers to informal waste workers as "(…) the backbone of India's highly effective recycling system (…)"[283] and underlines that "(…) unfortunately, a number of municipal regulations impede the operation of the recyclers (…)."[284]

In 2009, the report of the Standing Committee on Urban Development emphasised the fact that waste reduction and source segregation are still the most neglected aspects when analysing India's solid waste management system. The members of the Standing Committee stated that one probable reason for this, among others, is the citizen's indifference towards waste segregation and the lack of community participation.

> When asked by the Committee, the Ministry of Urban Development identified the following major issues in SWM, which, in a nutshell, were responsible for the present grim scenario:
>
> (i) Absence of segregation of waste at source.
>
> (ii) Absence of funds and capacity with ULBs.
>
> (iii) Lack of planning, technical expertise and appropriate institutional arrangements.
>
> (iv) Unwillingness of ULBs to introduce segregation at source, proper collection, transportation and treatment/disposal.
>
> (v) Indifference of citizens and lack of community participation towards waste management due to lack of awareness.[285]

Further, the Position Paper on the Solid Waste Management Sector in India, published by the Ministry of Finance in 2009, emphasises that compliance with MSW Rules, 2000 "(…) remains a distant dream."[286] The MoF identifies lack of adequate capacities, lack of institutionalism and finances, as well as the lack of community awareness as reasons for the malfunctioning MSWM system.[287] The paper further stresses understanding the elements of a circular economy. "Efforts towards waste recycle, reuse, and resource recovery for reduction in waste and adoption of more advanced technological measures for effective and economical disposal of municipal solid waste is the need of the hour."[288]

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[282] Ibid., 30.
[283] Ibid., 29.
[284] Ibid.
[285] Ministry of Urban Development, *Standing Committee on Urban Development (2008-2009). Fourteenth Lok Sabha. Solid Waste Management. Thirty-Eighth Report* (New Delhi: Government of India, 2009) 12.
[286] Ministry of Finance, *Position Paper on the Solid Waste Management Sector in India*, 14.
[287] Ibid., 6–9.
[288] Ibid., 8–9.

> The objective of SWM is to reduce the quantity of solid waste disposed off on land by recovery of materials and energy from solid waste in a cost effective and environment friendly manner. (…) The goal of any ISWM plan is the recovery of more valuable products from the waste with the use of less energy and more positive environmental impact.[289]

The overall umbrella narrative of the position paper however is the "(…) necessity of private sector participation in urban development."[290] The paper addresses the current policy framework for PPPs in MSWM, analyses its challenges, and gives recommendations for better involvement of private sector companies in MSWM.

> In India by and large municipal authorities are providing solid waste management services. Of late, experiments to privatize certain solid waste management services are picking up and demonstrated improvement in the level of services in a cost effective manner. Private sector participation has been attempted in door-to door collection, street sweeping, secondary collection of waste, transportation of waste, composting of waste and power generation from waste and final disposal of waste at the engineered landfill.
>
> The present capacity of municipalities in India to manage the privatization process is, however, extremely limited. There is need for developing in-house financial and managerial capability to award contracts to private sector and monitoring services provided by the private operator since the onus of ensuring proper service delivery and compliance of standards lies with the local bodies.[291]

In fact, the MoF identified energy recovery as a prime motivator for WtE facilities

> In developed countries, environmental concerns rather than energy recovery is the prime motivator for waste-to-energy facilities, which help in treating and disposing of wastes. Energy in the form of biogas, heat or power is seen as a bonus, which improves the viability of such projects.[292]

While circling around the topic of further privatisation of MSWM and its benefits, the position paper does not address the role of the informal waste economy and the potential impacts of privatisation on informal workers. Nor does it go into detail about the responsibilities of producers and manufacturers.

By 2010, the Report of the Committee to Frame National Sustainable Habitat Standards for Municipal Solid Waste Management was released. The National Mission for Sustainable Habitat was approved by the Prime Minister's Council for Climate Change in June 2010. One of the deliverables of the Mission is the formulation of National Sustainable Habitat Standards. These standards would subsequently get integrated with relevant regulations to ensure that future developments are aligned with concerns related to climate change. With climate change concerns as an umbrella, the report focusses on community level participation and public awareness in regard to MSW segregation, as well as on the ULB's capacity to

[289] Ibid., 5+38.
[290] Ibid., 1.
[291] Ibid., 21.
[292] Ibid., 19.

implement given rules. The provisions are further shaped by the need to adopt "(…) the concept of Reduce, Reuse, recover & Recycle (RRRR)."[293] The role of industries and manufacturers is not addressed in detail.

As a result of the 2008 CAG report and its analysis of various kinds of waste and their management, the MoEF constituted a committee to evolve a roadmap for the management of waste in India. The Report of the Committee to Evolve Road Map on Management of Wastes in India was published in 2010. The report examines existing administrative and regulatory mechanisms to manage various types of waste and details strategies for sustainable waste management. It also highlights the responsibility and mismanagement of ULBs in the existing waste crisis, since the "(…) local self government bodies have neither any capability of implementing the MSWM Rules, nor have the resources for implementing the same."[294] The roadmap puts a strong emphasis on the negative impacts of improper MSWM on the environment and public health.

> Sustainable Waste Management envisages an integrated approach, encompassing technological, policy, administrative and legal actions to address the challenge of waste management in the country. Strategic planning based on local needs and long-term goals should inform any policy addressing community involvement and public health issues. Hence, there is a need for action to effectively translate these approaches into a unified goal, incorporating local, regional and national priorities. [295]

While it sees a role for private sector companies, the roadmap addresses the resource value of waste and the informal waste workers as it sees the clear responsibility of the respective authorities in ensuring an "(…) involvement of the informal sector in segregated collection, sorting, storage, resale and safe reprocessing."[296] It further calls for "[f]ormalizing a policy for popularizing internationally accepted hierarchy of waste management with a specific strategy devised for India"[297] and the need to amend the MSW Rules, 2000 "(…) to incorporate waste reducing, reusing and recycling methods and strategies for achieving sustainable waste management while setting targets and timelines for achieving reduction in generation of waste."[298] By addressing the incorporation of the waste hierarchy concept, the MoEF underlines its understanding of the importance of a circular approach to waste. The roadmap also acknowledges the institutional imbalance and the lack of ownership when it comes to

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[293] Government of Madhya Pradesh, *Report of the Committee to Frame National Sustainable Habitat Standards for the Municipal Solid Waste Management* (Government of Madhya Pradesh, 2010) 6.
[294] Ministry of Environment & Forests, *Report of the Committee to Evolve Road Map on Management of Wastes in India* (New Delhi: Government of India, 2010) 13.
[295] Ibid., iv.
[296] Ibid., 25.
[297] Ibid., vi.
[298] Ibid., 15.

MSW, and therefore calls for creating a "(…) nodal body to guide, monitor and train personnel for managing all kinds of waste, should be set up at the Central level."[299] Interestingly, one aspect which is not mentioned at all in the roadmap is that of the implications of climate change through improper MSW handling. Moreover, the chapter on MSW does not outline specific details of the responsibilities of industries or product manufacturers.

In March 2010, at the same time that the roadmap was published by the MoEF, the MoUD published its fifth report of the Standing Committee on Urban Development, Solid Waste Management: Action Taken by the Government on the Recommendations Contained in the Thirty Eighth Report of the Committee on Urban Development (Fourteenth Lok Sabha) on Solid Waste Management. The committee points out that it understands the role of municipalities in the overall waste economy as to "(…) reduce its [MSW] impact on public health, environment and aesthetics."[300] While this is the only time the public image of a city is addressed, the report continues to stress on a variety of aspects related to the impacts of improper waste handling on the environment and public health. The report does not address the resource value of waste in relation to informal workers, but does address the informal workers:

> The Committee would like to urge the authorities to ensure that not only the waste handling municipal staff but the rag pickers in unorganized sector, who are reported to be about 1.3 lakh in number and play a special role in segregation of waste, should also be provided with the adequate protective equipment and health checkup including other incentives like identity cards and use of public sanitation services.[301]

This committee also underlines the challenges of and opportunities for increased involvement of private sector companies. In regard to treatment technologies, the report keeps it brief by stating:

> At the same time the Committee desire that the Government must also ensure that only environment-friendly technological options are adopted so as to prevent further worsening of an already polluted urban environment.[302]

It further addresses the role of citizens in waste reduction and segregation and, like in 2008, the MoUD highlights this role and the identified issues related to it:

> (…)[t] he most important aspect in Solid Waste Management [is] i.e. reduction of waste and the segregation of waste at source, [which] is the most neglected one. In view of the Committee, it is probably because of indifference of citizens towards inculcating the habit

[299] Ibid., 10–11.
[300] Ministry of Urban Development, *Standing Committee on Urban Development (Fourteenth Lok Sabha). Solid Waste Management.* (New Delhi: Government of India, 2010) 20.
[301] Ibid., 31.
[302] Ibid., 23.

of segregating wastes as well as lack of community participation towards waste management.[303]

3.2.6. The Impact of the International Climate Change Debate and Initiatives to Solve the Indian MSW Crisis (2011–2015)

Prior to the United Nations Conference on Sustainable Development (UNCSD), also known as Rio 2012 or Rio+20, the MoEF published a book, Sustainable Development in India: Stocktaking in the Run up to Rio+20, 2011, in which it addresses the challenges of and opportunities for a sustainable development in India. While it covers the framework for sustainable development in India, achievements, and challenges as well as international agreements and innovative approaches towards sustainability, it is interesting to note that MSW and the connected challenge only play a minor role. The increment of MSW in the country is indeed recognised as an existing challenge which negatively impacts the environmental quality, but it is not further addressed, not even when discussing the climate change situation in India. Topical aspects, such as circularity or the resource value of waste, are also not addressed. In 2011, the MoEF notified India's Plastic Waste (Management and Handling) Rules, 2011, which replaced the earlier Recycled Plastics Manufacture and Usage Rules, 1999. With the release of the rules, the then Minister of Environment and Forests, Jairam Ramesh, stated:

> It is impractical and undesirable to impose a blanket ban on the use of plastic all over the country. The real challenge is to improve municipal solid waste management systems. In addition to the privatization and mechanization of the municipal solid waste management systems we must be sensitive to the needs and concerns of the lakhs of people involved in the informal sector.[304]

This was the very first time that a special focus was put on waste workers, with the rules explicitly recognising their role in the plastic waste management economy and notifying the municipal authorities to constructively engage with waste workers. The rules additionally put emphasis on extended producer responsibility and the role of the municipalities in order to initiate a process in which manufacturers would become involved in this, which was also a novelty and shifted the focus towards a sense of circularity and increased ownership.

The Toolkit for Solid Waste Management, which was formulated by the MoUD under the JNNURM and published in 2012, aims to provide comprehensive knowledge on solid waste management, applicable rules and regulations, and methods of project implementation. The MoUD puts emphasis on the impacts of an efficient MSWM system, as it "(…) benefits

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303 Ibid., 35.

304 Ministry of Environment and Forests, "Plastic Waste (Management and Handling) Rules, 2011 Notified. Explicit Recognition to Waste Pickers under New Rules", news release, 2011, http://pib.nic.in/newsite/PrintRelease.aspx?relid=69649.

in maintaining hygienic conditions leading to lesser health issues, better living environment, improved economic prosperity in the area, aesthetically cleaner surroundings with cleaner drains for storm water flow, cleaner water sources and safer neighbourhoods."[305] The toolkit goes into a lot of details in regard to private sector participation with its emphasis on analysing private sector participation in MSWM and different financing models. At the same time, the toolkit states that the "(…) approach to capacity building in SWM should be not only about technology and economics but also about (…) building sound institutions and good governance for attaining improved SWM" [306] as the solid waste management sector is "(…) not commercially attractive (…)."[307] The toolkit also briefly touches upon the waste hierarchy concept as favourable for implementation and required awareness building programmes. In regard to the informal waste economy, the toolkit states that "[w]aste recycling for paper, cardboards, plastics etc. are informal activities under MSW management. Such activities needed to be formalized under the urban local body or mobilizing Non Governmental Organization (NGO)."[308]

In 2013, the MoUD published an Advisory on Improving Municipal Solid Waste Management Services, in which the ministry, together with the CPHEEO, focusses on all elements of solid waste management, while underlining the degradation of the environment and public health. The advisory covers potential risks to the environment and public health and states in this context that the "(…) most obvious environmental damage caused by municipal solid wastes is aesthetic, the ugliness of street litter and degradation of the urban environment and beauty of the city"[309], underlining the cleanliness and the public image of the city. The MoUD identifies a "(…) [l]ack of financial resources, institutional weakness, improper choice of technology, lack of public participation in solid waste management, non-involvement of private sector (…)"[310] as the reasons for a malfunctioning MSWM system in India. The advisory criticises the involvement of waste workers in waste picking without suitable equipment as a "(…) blot on [the Indian] society (…)"[311] and recommends that ULBs may consider the "(…) important role of rag pickers in reducing the waste and the cost of transportation of such waste (…)."[312] As a way forward, the advisory combines elements of the waste

[305] Ministry of Urban Development, *Toolkit for Solid Waste Management, Jawaharlal Nehru National Urban Renewal Mission* (New Delhi: Government of India, 2012) 2.
[306] Ibid., 42–43.
[307] Ibid., 31.
[308] Ibid., 10.
[309] Ministry of Urban Development, *Advisory on Improving Municipal Solid Waste Management Services*, 3.
[310] Ibid.
[311] Ibid., 4.
[312] Ibid., 7.

hierarchy concept, decentralisation, better financial management of ULBs, as well as an increment of PPPs in MSWM. In the same year, the MoEF released the Draft MSW Rules, 2013, which were supposed to replace the MSW Rules, 2000. However, the draft rules received multiple objections as well as a Karnataka High Court stay order for being "regressive"[313], since aspects such as the adoption of the waste hierarchy concept, introduction of source segregation, recognition of the importance of decentralisation or inclusion of waste workers were not addressed.[314]

The Report of the Taskforce on Waste to Energy (Volume I), was published in 2014 by a task force which was constituted under the Planning Commission. In its report, the task force identifies technically feasible, financially affordable and environmentally sound processing and disposal technologies for MSW. It also evaluates technological options, financial mechanisms and institutional arrangements to enhance resource recovery and promote waste-to-energy technologies. The report highlights the need for an integrated approach towards MSW management, stressing reduction and segregation of waste at source, and also efficient utilisation of various components of the waste. It emphasises setting up centralised or decentralised waste processing facilities keeping in view the quantity and quality of waste generated and the financial viability of the processing technology. The report provides guidance for the selection of appropriate technology and clearly indicates technologies that could be adopted by various classes of cities. It lays emphasis on converting combustible waste into Refuse Derived Fuel (RDF) to be used in power plants based on RDF. In October of the same year, the Government of India launched its flagship programme, *Swachh Bharat Abhiyan* (*Swachh Bharat* Mission (SBM)), the Clean India Mission, which aims at improving the level of sanitation and cleanliness in the country with a vision to create a "clean India" by 2019 by providing basic infrastructural and service delivery in the field of sanitation, and adopting scientific methods to collect, process and dispose MSW. While this initiative puts a strong emphasis on the public image and the cleanliness of a city, the key objectives of the mission in regard to solid waste management include modern and scientific municipal solid waste management, capacity augmentation for ULBs, creation of an enabling environment for private sector participation, and a 100 percent rate of processing and disposal of MSW by 2019.[315]

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313 M. Suchrita, "Municipal Solid Waste Rules Amendments: Moef Asked to Formulate New Draft", *Down to Earth* July 4, 2015, https://www.downtoearth.org.in/news/municipal-solid-waste-rules-amendments-moef-asked-to-formulate-new-draft-42616 (last accessed April 11, 2019).

314 Ibid.

315 Ministry of Housing and Urban Affairs, *Waste to Wealth. A Ready Reckoner for Selection of Technologies for Management of Municipal Waste.*

> Swachh Bharat Mission is aimed at ensuring door-to-door garbage collection and proper disposal of municipal solid waste in all urban areas by 2019. The mission seeks the active participation of various stakeholders including the private sector and the citizens for Swachh Bharat to become a mass movement. The Union Ministry of Urban Development is responsible for achieving the objectives of Swachh Bharat Mission in urban cities and towns.[316]

This statement, from *Swachh Survekshan*, an annual survey conducted under the programme to rank cities, clearly shows that the involvement of multiple stakeholders is a prerequisite for a functioning MSWM system; however, the informal waste workers are not addressed.

Box 9: India's waste culture—*Swachh* as opposed to impure and polluted?

The term *swachh* derives from the Sanskrit and can be translated as 'clean' and 'pure' as opposed to 'polluted'. In the context of *Swachh Bharat Abhiyan* and the improvement of municipal solid waste management services, within which the objective is to reach a *swachh*—a clean—India, this terminology would imply that waste is understood as something 'unclean' or 'impure' or 'polluted'. This understanding directly feeds into, and, even more so, substantiates the already existing cultural and societal narrative surrounding the overall topic of MSW and that of India's waste workers, as outlined in Box 4, Box 8 and Box 11.

Source: Author's own.

The MoEF submitted the briefing paper on India's Progress in Combating Climate Change to the UNFCCC in December 2014. This publication attempts to present a range of initiatives highlighting enhanced actions in the area of mitigation and adaptation. While it addresses the policy designs and their implementation in the sectors which were already outlined in the NAPCC in 2008, it does not specifically discuss the MSW challenge or the outcomes of the attempted work on recycling of material and improvement of urban waste management.

After having sparked the backlash regarding the Draft MSW Rules, 2013, the MoEFCC revised the draft rules and published another set of Draft Solid Waste Management Rules, 2015, in April 2015, for public comments. The MoEFCC had adapted the draft rules in accordance with the critique and had incorporated changes in relation to a variety of aspects, such as recognising the role of informal waste workers to some extent, highlighting elements of the waste hierarchy concept, and framing an objective of zero waste going to landfills. The C&D waste received a separate chapter in the draft rules, in which the management and the responsibilities in this regard were addressed.

[316] Ministry of Urban Development, *Swachh Survekshan* (New Delhi: Government of India, 2016).

Later that year, the GoI launched another initiative on urbanisation, the Smart Cities Mission. This initiative on urbanisation aims to create 100 'smart cities' to support economic growth and provide technological solutions to water and waste management, and "(…) the objective is to promote cities that provide core infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment and application of 'Smart' Solutions."[317] The Ministry of Urban Development in collaboration with state governments of the respective cities is responsible for the implementation of the initiative. Core infrastructure elements in a smart city would also include solid waste management, with a focus on waste-to-energy, waste-to-fuel, waste-to-compost and waste recycling. Also, in October 2015 and as a response to the UN's 2030 Agenda for Sustainable Development,[318] the MoEF submitted India's Intended Nationally Determined Contributions (INDCs) to the UN Framework Convention on Climate Change (UNFCCC), committing to cut the emissions intensity of the gross domestic product (GDP) by 33 to 35 per cent by 2030 from 2005 levels. The INDCs, which lay out the blueprint for tackling climate change, emphasised eight key goals, namely sustainable lifestyles, cleaner economic development, reducing emission intensity of GDP, increasing the share of non-fossil fuel-based electricity, enhancing carbon sink, adaptation and mobilising finance, technology transfer, and capacity building. In regard to solid waste management, India's INDCs refer to the *Swachh Bharat* Mission with the objective of making the country clean and litter free with scientific solid waste management by 2019.[319]

3.2.7. A 16-Year-Long Lesson Learned—Towards a More Inclusive and Circular Approach? (2016)

In April 2016, the MoEFCC notified the revised Solid Waste Management Rules, 2016. After a year-long lesson learned, this set of rules replaced the Municipal Solid Wastes (Management and Handling) Rules, 2000, which had been in place for the past sixteen years. The SWM Rules, 2016, have moved beyond an environment-only policy and instead address multiple other aspects and introduce mechanisms for a sustainable municipal solid waste management system. One of the major revisions is that the range of stakeholders and their responsibilities and functions has been outlined in detail, including the recognition of the crucial role of informal waste workers within the existing system. In addition, the waste generator has been

[317] Ministry of Urban Development, *Smart Cities Mission,* 5.
[318] The 2030 Agenda was adopted by all UN member states in September 2015 and calls for sustainable development and poverty reduction. It aims at reconciling global economic progress with social justice and the conservation of natural resources. The 2030 Agenda includes seventeen Sustainable Development Goals. United Nations, "Sustainable Development Goals", United Nations, https://sustainabledevelopment.un.org/post2015/transformingourworld (last accessed April 17, 2019).
[319] Forest and Climate Change Ministry of Environment, *India's Intended Nationally Determined Contribution* (New Delhi: Government of India, 2015).

given responsibilities, relying on the positive effects of increased community participation, for example, in source segregation. Moreover, the rules promote decentralised processing of MSW in the form of composting of organic waste or encouraging technologies such as bio-methanation. The rules also introduce the waste hierarchy concept, as they place emphasis on the need to ensure minimisation of waste going to landfills.[320] Local authorities shall allow only the non-usable, non-recyclable, non-biodegradable, non-combustible and non-reactive inert waste and pre-processing rejects and residues from waste processing facilities to go to sanitary landfill. The rules further underline that efforts shall be made to adopt a zero-waste concept, which is an essential departure from previous recommendations, which stressed on the importance of sanitary landfills.[321] Moreover, the rules introduce economic instruments, or elements of those, such as extended producer responsibility and user fees: the rules mandate manufacturers to introduce a system for a collect-back scheme for packaging waste.[322] In addition, manufacturers of sanitary napkins and diapers "(…) shall explore the possibility of using all recyclable materials in their products."[323] One more aspect is the promotion of informal recycling initiatives by ULBs providing incentives to the informal waste recycling sector.[324] The combination of introducing source segregation, recycling performance standards, EPR, and incentivising the informal recycling activities is a positive sign of the Indian government's attempt towards improvement of the existing recycling system. However, a framework including industry targets for recycling, introduction of certification, and ensuring waste is used as a raw material would further enable and foster a 3R driven approach in MSWM.

Apart from the mentioned aspects, the MoEFCC legislatively split the C&D waste fraction from the MSW fraction by dedicating a whole new set of rules to C&D waste: realising the management and treatment challenge connected to the annual estimate of 716 million tonnes of C&D waste, the MoEFCC notified (at the same time as it notified the SWM Rules, 2016) the Construction and Demolition Waste Management Rules, 2016. The rules further promote economic instruments, with the introduction of user charges as well as aspects of a framework for extended producer responsibility by making the producer of certain products responsible for the entire product lifecycle. With all these new elements and adaptations, the rules potentially open up a way for a more inclusive and circular approach towards India's

[320] Ministry of Environment, Forest and Climate Change, "Solid Waste Management Rules, 2016", 11(b).
[321] Ibid., 15(zi).
[322] Ibid., 17(2).
[323] Ibid., 17(3).
[324] Ibid., 15(u).

municipal solid waste management, thereby opening up the MSWM policy process to new mechanisms and forces.

> The policies and regulations applicable to the post-consumption stage of the product life cycle in India increasingly draw attention to the relevance of resource efficiency and secondary resource management. As existing policies are revisited and revised to adapt to the current scenario, there is a relatively greater emphasis on issues related to RE and SRM, yet none of the policies close the loop as they mostly adopt approaches which are not comprehensive and leave vagueness with regards to responsibilities, ownership and financing tools.[325]

While the rules are largely understood as "inclusive and progressive"[326], the recurring discussion in the public debate[327] surrounding the SWM Rules, 2016 is that the recognition of waste workers has not translated into reality. This results in a lack of integration of waste workers, as well as of elements of accountability, because the rules neither include a mechanism to ensure the integration of all stakeholders, nor do they consider a form of accountability in case the responsibilities are not fulfilled. The question of who drives the rules of enforcement remains central. In addition, there is criticism of the lack of incentivising local technologies and introducing social incentives for source segregation. Like in 2000, the MoUD published a revised manual version, the *Swachh Bharat* Mission Municipal Solid Waste Management Manual, 2016, at the same time the SWM Rules were notified. The manual provides guidance to urban local bodies on the planning, design, implementation and monitoring of municipal solid waste management systems. Issues of environmental and financial sustainability of these systems are a critical consideration.

The MoUD manual addresses MSWM challenges and how to deal with them, reflecting on recent technological, financial and policy level developments. The manual emphasises aspects such as the adoption of the waste hierarchy concept, enhancing private sector participation, adoption of principles of EPR, and the integration of informal waste workers. The manual further stresses the ISWM approach in order to not only focus on the technical aspects of a functioning MSWM system, but also other elements such as interaction and

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325 Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, "Resource Efficiency (Re) and Secondary Resource Management (Srm) as a Foundation for Environmental Policy in India", (Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, 2017), 17.

326 NGO representative, New Delhi, February 11, 2017.

327 Swati Singh Sambyal, "Government Notifies New Solid Waste Management Rules", *Down to Earth*, September 19, 2016, https://www.downtoearth.org.in/news/waste/solid-waste-management-rules-2016-53443 (last accessed April 11, 2019); Suchrita, "Municipal Solid Waste Rules Amendments: Moef Asked to Formulate New Draft"; Nomesh Bolia and Apula Singh, "Solid Waste Management Rules 2016: How Well They Have Been Implemented on Ground?", *The Indian Express*, May 1, 2017, https://indianexpress.com/article/what-is/solid-waste-management-rules-2016-how-well-they-have-been-implemented-on-ground/ (last accessed April 9, 2019); Satwik Mudgal, "A Clean Country in the Offing with New Solid Waste Rules", *Down to Earth*, September 17, 2015, https://www.downtoearth.org.in/blog/a-clean-country-in-the-offing-with-new-solid-waste-rules-49484 (last accessed April 10, 2019).

integration of relevant stakeholders. Institutional ownership and the requirement for public awareness and education programmes are two more aspects the manual elaborates on, yet again focusing strongly on the importance of public participation in a functioning MSWM system. Also, in 2016, the MoEFCC notified the revised Plastic Waste Management Rules, 2016, which, like the Solid Waste Management Rules, 2016, include adaptations in relation to the responsibility of waste generators for source segregation. Moreover, while EPR in the 2011 rules was the responsibility of the municipalities, the 2016 rules make producers and brand owners responsible for collecting waste generated from their products. With these provisions, the Plastic Waste Management Rules, 2016, establish a broader sense of ownership related to different stakeholders involved, and not just the municipalities. Another provision of the 2016 rules states that manufacturing and use of non-recyclable multi-layered plastic shall phase out by 2018.[328] In April of that same year, NITI Aayog started the Urban Management Programme, an initiative in which the focus is on capacity building of officials of state governments and ULBs in three aspects of urbanisation—water, wastewater and solid waste management. With placing a strong emphasis on 3R and WtE solutions through public–private partnerships, the initiative underlines the profitability of waste as well as a possible circularity.[329]

3.3. Discussion and Summary

Understanding the mechanisms and factors that have shaped political developments over the past thirty years in the MSW context is important in order to understand why the MSWM agenda in India has developed in a certain way, how it might develop further, and what could be a sustainable and feasible way to move forward when further developing and establishing a sustainable MSW system. The landscape of rules and policies related to municipal solid waste in India as well as the overall understanding of the subject has undergone major developments and shifts in the past three decades. While the primary drivers for MSWM are considered to be public health, environment protection and the resource value of waste, more recent drivers such as climate change and circular economy have gained in importance, as outlined in Table 4. Over the years, the composition of drivers for the improvement of MSWM have significantly changed. The early years of India's MSWM agenda setting are marked by the realisation of the immediate impacts of a loose legal framework on the

[328] Ministry of Environment, Forest and Climate Change, "Plastic Waste Management Rules, 2016", (New Delhi: Government of India, 2016).
[329] Sunita Sanghi and Jeetendra Singh, "Waste, Wastewater and Solid Waste Management Issues in Indian Cities", NITI Aayog, http://www.niti.gov.in/content/water-wastewater-and-solid-waste-management-issues-indian-cities (last accessed April 26, 2019).

environment and human well-being. The early 1990s are shaped by an increased public awareness, the cleanliness of a city and responsibility-related concerns. The Bajaj report of 1995 identifies the need for increased civic responsibility, puts the waste generator in charge of its produced waste, and creates an essential understanding of ownership at the community level. This aspect stands in direct relation to the level of public awareness. As mentioned earlier, MSW is still considered something 'dirty', and the sense of ownership at the community level is lacking.

This period was also marked by the officials' understanding of the impacts of an insufficiently functioning MSWM system on the economy of the city and the entire country, as was the case in Surat. This driver of the free market and business profits turns out to play an increasingly essential role in the Indian context. While all drivers are interlinked in some way or the other, it becomes evident that the drivers of business interests and profit motives play a key role, since the drivers of the resource value of waste, circular economy or cleanliness stand in direct relation to business interests and profit motives as drivers of a sustainable MSWM. It was the MSW Rules, 2000 which officially consolidated this central position of business interests as one of the key drivers of MSWM. The recommendations of the Asim Burman Committee report and the incorporation of the same in the first Municipal Solid Waste (Management and Handling) Rules, 2000 set the scene for an enabling framework for increased formal private sector participation in MSWM. The years after 2000 can be characterised by the impact of this continuous process of privatisation of selected MSWM elements. India, being one of the most populated countries in the world, throughout finds itself at the centre of the international environment and climate change debate:

> India is a signatory to various multinational agreements carried out since 1960 and has shown much interest to conserve a global environment. The strong and internationally acceptable points put in Stockholm conference, Rio conference and World Summit on Sustainable Development indicates the [sic] India's commitment to protect environment.[330]

Henceforth, the introduction of the waste hierarchy concept as well as elements of a circular economy need to be seen against the backdrop of India's role in a global governance setting. The present research further revealed that stakeholders who are active in the field of MSWM, as well as government documents, suggest and consider additional drivers such as political aspects and elections to be essential factors in MSWM development.

Waste management policies in many countries of the Global South are usually characterised as centralised: by applying top-down approaches, the context and circumstances in

[330] Vilas, "A Critical Overview of Legal Profile on Solid Waste Management in India", 2.

which these policies will be applied are often not considered.[331] In addition to this, legal frameworks often do not specify the roles of relevant stakeholders in the waste system, which leads to a lack of responsibility and creates a gap between policy and implementation. Lack of enforcement and monitoring of the implementation of existing rules and policies further add to this gap.[332] When analysing the legal MSWM framework over the years, it becomes evident that this very classical, centralised approach to MSWM has been applied statically until 2016, leading to solutions that do not distinguish between the different MSWM needs for every city and the Indian MSWM context.

> In India, many stringent rules and policies have failed due to the presence of a large number of informal sector workers who consider waste as a resource and opportunity. […] Some of the major issues and challenges faced during the implementation process can be attributed to the gaps and overlaps in the system. First, the gap in the legal framework which does not specify the role of different stakeholders is a major lacuna in the existing system. No mandatory requirements are imposed on activities that are likely to cause direct or indirect impact on environment or health. This leads to unequal competition between those who comply and those who do not comply with the existing rule of law. In other words there are no rewards for compliance and no punitive action is taken against the erring units. [333]

Applying a bureaucratic approach in the policies and rules, and banking on capital-intensive approaches for the treatment of MSW, created a situation in which the top-down approach left little room for more community participation, context-specific treatment technologies, and a way of cooperating with informal waste workers.

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331 Martin Medina, "Scavengers Cooperatives in Developing Countries", *BioCycle: journal of composting & organics recycling* 39, no. 6 (1998); UN-Habitat, *Solid Waste Management in the World's Cities*; Chaturvedi, Arora, and Kilguss, "E-Waste Recycling in India–Bridging the Formal–Informal Divide", 205.

332 Martin Medina, "Globalization, Development, and Municipal Solid Waste Management in Third World Cities", (Tijuana, Mexico: El Colegio de la Frontera Norte, 2002), 5.

333 Chaturvedi, Arora, and Kilguss, "E-Waste Recycling in India–Bridging the Formal–Informal Divide", 209-12.

Table 4: India's MSW related rules, policies and missions and its main drivers

	EPA, 1986	Abatement of Pollution, 1992	Recycled Plastics Manufacture and Usage Rules, 1999	MSW Rules, 2000	JNNURM, 2005	NEP, 2006	NAPCC, 2008	Plastic Waste Rules, 2011	SBM - Urban, 2014	Smart Cities Mission, 2015	SWM Rules, 2016	Plastic Waste Rules, 2016
Public Health				✓		✓						
Environmental protection	✓	✓	✓	✓		✓						
Resource value of waste		✓	✓			✓	✓	✓			✓	✓
Institutional responsibility			✓			✓					✓	✓
Public awareness									✓	✓		
Cleanliness				✓					✓	✓		
Business interest				✓	✓	✓			✓	✓	✓	
International cooperation					✓				✓	✓		
Climate Change							✓					
Circularity			✓			✓	✓	✓			✓	✓

Source: Author's own.

Over and above this, until the SWM Rules, 2016, the approach was entirely framed for the formal sector, not considering the informal workforce. While the majority of the relevant government documents have been published by either the MoEFCC or the MoUD, it is interesting to note that the Ministry of Health and Family Welfare does not play any major role in the MSWM debate, especially considering that MSW is part of public health and sanitation. The current policies, rules, manuals and initiatives seem, depending on the respective issuer, disconnected from each other, which underlines the silo-like establishment of the institutions involved. While MSW is often seen as an environmental policy issue, it is a much more complex one, comprising environmental policy, urban planning and infrastructure, social justice, institutional structure and health. When analysing government documents over the past thirty years, there emerges the need for closer interaction between the different related ministries and state level institutions as well as local bodies. "A comprehensive policy framework is (…) needed at the national and state levels. This should link public health, environmental and decentralization polices more closely together so that these are mutually supportive."[334]

Although the SWM Rules, 2016 have gone into finer detail of nearly every MSWM element, the rules reveal gaps in regard to implementation and enforcement. What is required is a more comprehensive and coherent introduction of certain policy and economic instruments such as EPR, or PAYT schemes, in which the waste generator has to pay directly and in accordance with the amount of waste produced. The introduction of incentives as well as penalty fees for waste generators and recyclers could increase the level of ownership and help in acting according to the given rules. Once the informal waste workers are acknowledged and integrated into the formal waste management chain, synergies can be created, and the impact of informal waste workers can be utilised effectively by the ULBs. Involving NGOs and waste pickers' unions and cooperatives in the promotion of decentralised processing, which itself should be incentivised, could be another way forward in making the rules more inclusive and progressive.

In the Solid and Hazardous Waste Management division of their website, the National Environmental Engineering Research Institute under the Ministry of Science and Technology, states that "[t]he primary focus of the solid waste management has been shifting over the years from quantification and characterization of solid waste in early years to reuse,

[334] Central Public Health & Environmental Engineering Organisation, "Report of the Technology Advisory Group on Solid Waste Management", 6.

recycle, and energy recovery from solid waste in recent years."[335] While the shift towards reuse, recycle and energy recovery is certainly welcome, it is the understanding of quantification and characterisation which is very concerning: it is widely known that India faces a data gap when aiming to tackle its MSW challenge, which is one of the biggest hurdles when it comes to a fitting treatment of MSW. The lacuna of reliable data on MSW and the lacuna of a functioning system to collect data is well known and is being addressed regularly, even in public conferences and debates. It is alarming that NEERI, which is involved in MSW research activities, considers the primary focus to have shifted away from the quantification and characterisation of India's MSW, since, as an NGO representative stated: "As long as you don't know what you are dealing with, you cannot solve the issue."[336]

4. India's MSW Policy Framework against the Backdrop of the Waste Hierarchy Concept

The policy logic of the waste hierarchy concept favours reduction, reuse and recycling of material ahead of recovery processes and disposal solutions. In its essence, this ranking aims at creating a sustainable (policy) umbrella in order to change consumption and production patterns, to reduce the gradually increasing consumption and alter the production processes, and, as a result, impact the increasing waste generation and the handling of the same. This concept or elements of it have been globally introduced in MSWM policy frameworks. With the European Union and countries in Asia such as Japan and China incorporating elements of waste hierarchy into their legislative framework since the beginning of the 2000s,[337] this concept has become a kind of 'norm' which is followed in order to identify and then further develop suitable MSW solutions. In the past years, India has increasingly been drawing on the waste hierarchy concept and specific elements of the same, as the value of waste continues to increase, especially in times of global resource scarcity, when waste is seen as a resource with a business potential, rather than a burden on municipalities and citizens. India's MSWM policy framework shall be analysed in order to understand how far the government has incorporated and implemented elements of the waste hierarchy concept over the past years. In order to sustainably implement the logic of waste hierarchy in the context of MSWM, and to

[335] National Environmental Engineering Research Institute, "Municipal Solid Waste Management", National Environmental Engineering Research Institute, http://www.neeri.res.in/division/solid-and-hazardous-waste-management-division (last accessed April 10, 2019).
[336] NGO representative, New Delhi, May 20, 2017.
[337] European Commission, "The Sixth Environment Action Programme (6th EAP)"; European Commission, "Roadmap to a Resource Efficient Europe"; Ministry of Environment, "Fundamental Plan for Establishing a Sound Material-Cycle Society"; Government of People's Republic of China, "Circular Economy Promotion Law of the People's Republic of China".

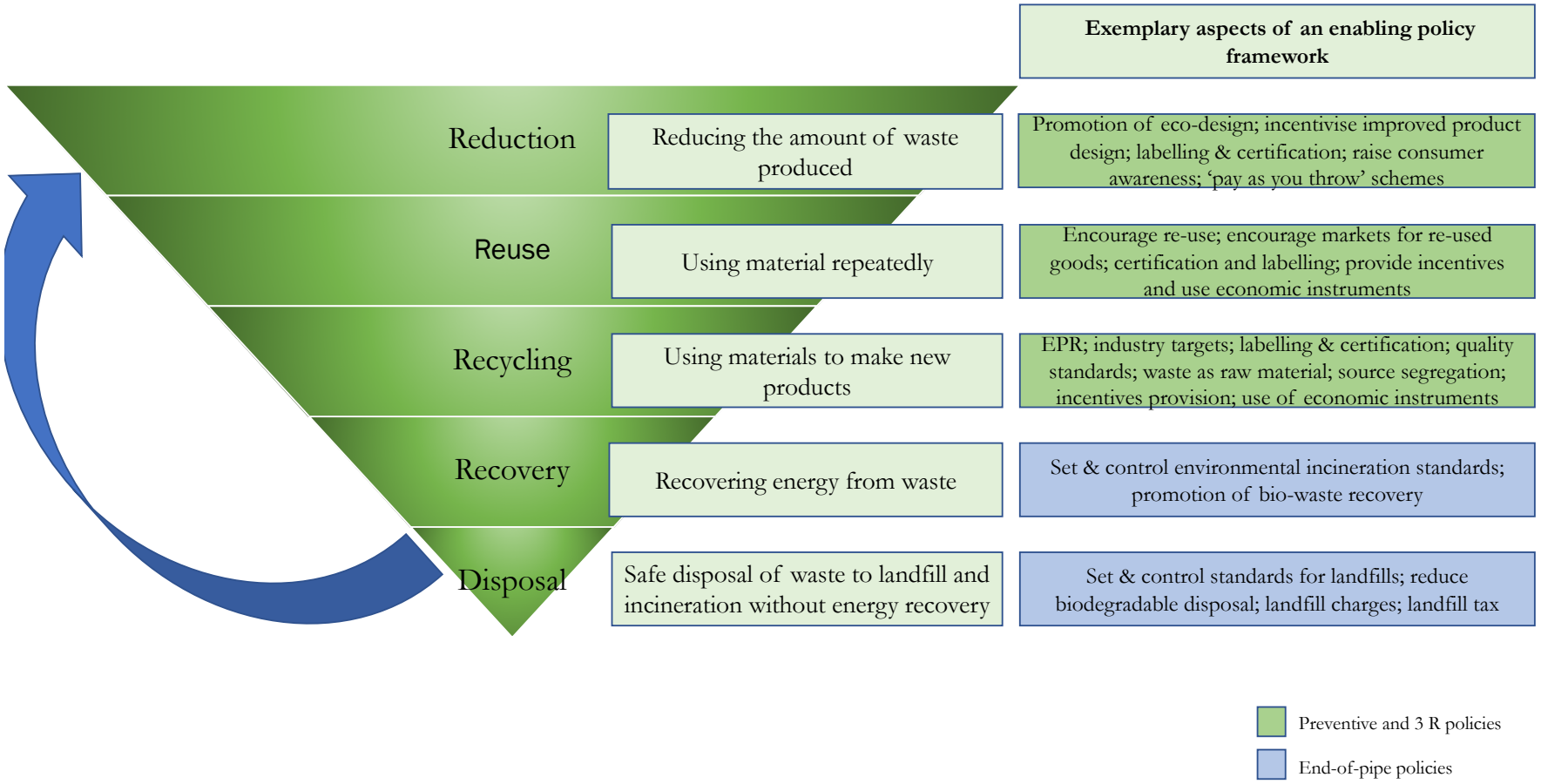
create an enabling framework, certain aspects such as promotion of source segregation, promotion of decentralised waste management and encouragement of EPR need to be incorporated in a political setting.

4.1. An Enabling Policy Framework for the Waste Hierarchy Concept

The prioritisation of waste reduction, reuse and recycling solutions, as well as the sustainable implementation of recovery and disposal principles, require an enabling policy framework. The three more favourable elements of the waste hierarchy—reduce, reuse and recycling—require a framework which can be characterised by a mix of preventive and 3R policies, while the elements of recovery and disposal can be framed by end-of-pipe policies. Figure 3 is an overview of exemplary aspects feeding into an enabling policy framework for each of the five waste hierarchy elements. The preventive policies at the front-end of a product lifecycle encompass policy and economic instruments such as EPR, or PAYT schemes and policies related to eco design, for instance. A framework including mandatory source segregation, setting of quality standards and introduction of certification, as well as the introduction of EPR enables and fosters a 3R driven approach in MSWM. The end-of-pipe policies mostly include the setting and monitoring of introduced standards, as well as landfill fees and landfill taxes.

In order to set the scene for a better understanding of how India's MSWM agenda has been influenced by elements of the waste hierarchy concept throughout the years leading up to 2016, it is important to underline the enabling policy aspects at each of the five steps, as depicted in Figure 3.

Figure 3: Exemplary aspects of an enabling policy framework for the implementation for the waste hierarchy in the MSWM context



Source: Author's own, based on EC (2008).

Sustainable waste management begins with the prevention of waste being produced in the first place. Policies targeting MSW reduction at the generators' end encompass preventive policies which address the root cause of the continuously increasing MSW generation. Waste prevention is closely linked to improving manufacturing methods on the one hand, and, on the other, impacting the consumers' decision to demand goods that produce less waste. In this way, an MSW reduction enabling setting involves policies targeting producers and manufacturers as well as consumers. One of the key tools for encouraging waste reduction is eco-design: recycling secondary raw materials and avoiding the use of hazardous substances are two key elements in the production of eco-friendly products. When the provision of incentives for eco-design is being introduced and better product design is being encouraged by differentiating the financial contribution of producers under extended producer responsibility schemes, it increases the chances for green manufacturing. At the same time, the producers of less green products can be addressed by using economic instruments such as taxation in order to reflect the environmental costs in the product price of a non-green product. In order for these schemes to be effective, it is essential to raise consumer awareness so that the consumer demands greener products and less packaging. Being able to take an informed decision when buying a product puts the consumer in a position to drive the creation of a greener and more resource efficient market. The consumer level can be further addressed by introducing economic instruments such as 'pay-as-you-throw', in which, as mentioned earlier, the waste generator has to pay directly and in accordance with the amount of waste which is produced.

To repeatedly use products and components for the same purpose for which they were conceived needs first and foremost a market for reused goods. Therefore, an enabling policy framework for reuse includes mechanisms that encourage reuse as such and encourage markets for reused goods. The introduction of certification for reused goods can support a functional reused goods market. In addition, it is essential to create consumer awareness.

The process of recycling reduces the amount of waste in landfills, while at the same time reducing the pressure on the material extracted from the environment for production purposes. Much of the waste that is being produced can be recycled. In order to create an enabling policy framework for the process of recycling, it is essential to set recycling targets for MSW recycling and put a system in place to ensure that these targets are met. These systems include EPR, making producers responsible for the entire life-cycle of the products they produce, including the stage at which the product becomes waste. To ensure that waste is being used as raw material is another aspect which needs to be considered in an enabling

setting. Moreover, the introduction and implementation of quality standards and certification for recycled products impacts the consumer's buying decision. While individuals therefore play an important role at the end of the recycling process, they play as essential a role at the beginning of the recycling process, once the waste is being produced, as source segregation is an important prerequisite to ensure a smooth and high-quality recycling process. Organic waste can moreover function for recycled composting, which can improve the soil quality, with non-renewable fertilisers being replaced by organic waste compost.

After reduction, reuse and recycling, the energy recovery from MSW is the second least favourable element of the waste hierarchy. Waste incineration plants can be used to produce electricity, steam or heat. Waste can be further used in the form of fuel pelletisation for industrial processes. The burning of MSW needs to be controlled and under certain conditions, as waste burning causes negative impacts on the environment and public health if the process is poor or incomplete, since hazardous chemicals can be released during the burning process. Energy generation through incineration requires a minimum calorific value, otherwise the waste, such as biodegradable and inert material, is unfit for burning. The setting and controlling of environmental incineration standards are therefore an essential step when turning to the method of MSW incineration. Setting limit values for plant emissions and thresholds for energy efficiency of MSW incinerators, and the monitoring of both, are two legislative methods to ensure an enabling framework for the recovery of waste, which is generally considered not to be the most efficient way of MSWM. Biodegradable waste and the recovery of energy from this MSW waste fraction plays a significant role, especially in the climate change debate, as it can function as a renewable source of energy. Energy recovered from biodegradable waste in the form of either biogas or thermal energy, has considerable potential, especially when the share of biodegradable in the overall MSW composition is high. To create an enabling setting for organic waste to fill in the mentioned roles, it is essential to set renewable energy targets and promote bio-waste recovery.

While disposal of MSW in landfills is the least favourable option in the waste hierarchy, it still remains the most common form of MSW disposal. Landfills are considered epicentres of air pollution and soil and groundwater contamination. With the release of large quantities of methane and carbon monoxide, and the oft-occurring landfill leachate from the breakdown of biodegradable waste in them, landfills can contaminate the local groundwater and soil and consequently pose a risk to public health and the environment. A legislation that sets and ensures landfill standards and transfers the responsibility of issuing landfill permits and landfill inspections to authorities, is key to sustaining safe disposal of MSW. The introduction

of landfill charges or taxes is a method for more sustainable waste management. The introduction of landfill fees or landfill taxes—both globally used instruments—serves as an incentive to divert MSW from landfills, as alternative treatment options, such as recycling or reuse, for example, become cheaper in comparison. Landfill taxes are charged by national governments to public or private operators of disposal sites, while landfill fees are charged by the municipal authority to the public or private waste management provider and levied upon a given quantity of waste received at a landfill. Further, it is essential to make the reduction of biodegradable in the landfills mandatory and use the existing methane gas in landfills to produce energy.

4.2. Elements of the Waste Hierarchy Concept in India's MSWM Agenda

The principles of 3R were already pronounced in understanding MSWM since the early 1990s, with concepts of and approaches to recycling and minimisation having been addressed theoretically in a variety of government documents.[338] The same government documents encompass elements related to disposal, and later, to recovery of energy from waste. The logic of the waste hierarchy as a concept has been introduced in the Indian MSW agenda setting with the MSW manual published by the MoUD alongside the first MSW Rules, 2000.[339] While the MoUD manual addresses the waste hierarchy concept theoretically, the first MSW Rules, 2000, do not integrate the concept of the waste hierarchy into the rules, which resulted in a variety of institutions, even the MoEF itself, calling for the incorporation of the waste hierarchy concept in the MSWM agenda. In 2008, the CAG stated that the "MoEF may consider framing a specific policy for the management of wastes in India, incorporating the internationally accepted hierarchy for management of wastes"[340], and by 2010 the MoEF itself stated that a "(...) specific policy for the management of wastes in India, incorporating the internationally accepted hierarchy for management of wastes should be framed."[341]

Just as with the drivers of sustainable waste management, the balance among the five different elements that constitute the waste hierarchy continues to vary over time. Moreover, the composition of these five elements, also in relation to a strategic objective, depends on

[338] National Plastic Management Task Force; Planning Commission, *Report of the High Power Committee. Urban Solid Waste Management in India*; Supreme Court of India, *Solid Waste Management in Class 1 Cities in India. Report of the Committee Constituted by the Hon. Supreme Court of India.*

[339] Central Public Health & Environmental Engineering Organisation, *Manual on Municipal Solid Waste Management*.

[340] Comptroller and Auditor General of India, *The CAG Audit on Municipal Solid Waste in India*, 3.

[341] Ministry of Environment & Forests, *Report of the Committee to Evolve Road Map on Management of Wastes in India*, 10.

the context and the stakeholders involved. India's MSWM agenda has transformed in regard to all five waste hierarchy elements, and by the end of 2015, one of the MoEFCC's proclaimed aims is to "(…) partner with other relevant ministries of the Government of India, private and public enterprises towards creation of a facilitative environment for recycling to promote sustainability and decouple growth from environment degradation."[342]

4.2.1. The Waste Hierarchy Logic in the Indian MSWM Agenda Setting Leading up to the Solid Waste Rules, 2016

The waste hierarchy and its five elements are based on fundamental aspects. In order to understand the incorporation of the waste hierarchy logic in the MSWM agenda setting, seven aspects have been identified, which function as prerequisites for a comprehensive incorporation of the waste hierarchy logic in the Indian context.

Promotion of Source Segregation

Once the waste is produced, source segregation is one of the most essential steps for an effective MSWM, as it allows all the processes—if it is reuse, recycling, recovery or even disposal—to occur in a more efficient and qualitative manner. At the same time, and maybe even more importantly, source segregation increases the waste generators' awareness of the issue at hand.

The awareness that source segregation is essential for a sustainable MSWM was mentioned more than two decades ago, in 1995, in the Urban Solid Waste Management in India report by the Planning Commission. As outlined in Table 5, in the years that followed, a variety of government documents addressed the requirement of source segregation. The MSW Rules, 2000 address source segregation, but do not assign a specific duty to the waste generator, as the waste generator was merely encouraged to segregate waste, which leaves the whole setting rather vague.

Throughout the documents there is a common consensus that in order for source segregation to function, awareness needs to be created so that community participation can rise. Moreover, the MoUD in its 2013 published Advisory on Improving Municipal Solid Waste Management Services outlines very clearly that a habitual change in the waste generator is very much needed in order for source segregation to be established.

> If citizens show such apathy and keep on throwing waste on streets and expect that municipal sweepers should/would clean the city, the cities will never remain clean. Even if local bodies make arrangements to remove all the waste disposed of by the citizens on the street on day to day basis, the city will remain clean only for two to three hours and not beyond till the habit of throwing waste on the streets is not changed. There is,

[342] Ministry of Environment, "Javadekar Announces Formation of Indian Resource Panel".

> therefore, a need to educate the people to store waste at source, dispose of the waste as per the directions of the local bodies and effectively participate in the activities of the local bodies to keep the cities clean.[343]

In addition to this, throughout the years leading up to the revised Solid Waste Rules in 2016, the call for mandatory source segregation became louder.

[343] Ministry of Urban Development, *Advisory on Improving Municipal Solid Waste Management Services*, 6.

Table 5: Promotion of source segregation

Document	Year	How it addresses aspects of source segregation
Report of the High Power Committee. Urban Solid Waste Management in India, Planning Commission	1995	The report acknowledges the fact that there is no system of segregation of organic, inorganic and recyclable wastes at household level in place. The report recommends under 3.2.1.1 that "[s]egregation of inorganic recyclable materials like plastic, glass, metals, papers at the source should be promoted and every effort should be made to collect the same in separate receptacles or bags in each house."[344]
Recommendations for the Modernization of Solid Waste Management in Class I Cities in India**,** Supreme Court of India	1999	The report puts emphasis on storing wastes at the source of generation in two bins/bags, one for food waste/biodegradable wastes, and another for recyclable waste.
Municipal Solid Wastes (Management & Handling) Rules, 2000, MoEF	2000	Schedule–II of the rules states that "[i]n order to encourage the citizens [to segregate waste], municipal authority shall organise awareness programmes for segregation of wastes and shall promote recycling or reuse of segregated materials. The municipal authority[345] shall undertake phased programme to ensure community participation in waste segregation. For this purpose, regular meetings at quarterly intervals shall be arranged by the municipal authorities with representatives of local resident welfare associations and non-governmental organizations."
Report of the Technology Advisory Group on Solid Waste Management, MoUD	2005	The advisory group identifes source segregation and the promotion of the same as a key requirement in order to be able to ensure that a mismatch between waste and any chosen technology is minimised. One of the identified core messages is the need to segregate recyclable waste from wet biodegradable waste.[346]
CAG	2008	The report recommends that waste segregation be made mandatory and that it should be given more emphasis by means of publicity and awareness campaigns.[347]

[344] Planning Commission, *Report of the High Power Committee. Urban Solid Waste Management in India*, 4.
[345] Ministry of Environment & Forests, "Municipal Solid Wastes (Managment and Handling) Rules, 2000", 896.
[346] Central Public Health & Environmental Engineering Organisation, "Report of the Technology Advisory Group on Solid Waste Management", 19+99.
[347] Comptroller and Auditor General of India, *The CAG Audit on Municipal Solid Waste in India*, 6.

Standing Committee on Urban Development (2008–2009). Solid Waste Management, MoUD	2009	"Notwithstanding these few instances, the Committee still feel that the most important aspect in Solid Waste Management, i.e. reduction of waste and the segregation of waste at source, is the most neglected one."[348] The committee further promotes source segregation through enhanced public awareness.
The Position Paper on Solid Waste Management, MoF	2009	The Position Paper emphasises the need for source segregation as segregation of waste is a catalyst to success of alternative means of waste disposal.[349]
Standing Committee on Urban Development (2009–2010). Solid Waste Management, MoUD	2010	"(…) the Committee still feel that the most important aspect in Solid Waste Management, i.e. reduction of waste and the segregation of waste at source, is the most neglected one. In view of the Committee, it is probably because of indifference of citizens towards inculcating the habit of segregating wastes as well as lack of community participation towards waste management."[350]
Report of the Committee to Evolve Road Map on Management of Wastes in India, MoEF	2010	"Segregation of wastes must be at the level of residential/institutional/Govt Departments so as to facilitate door-to-door collection of segregated waste."[351]
Advisory on Improving Municipal Solid Waste Management Services, MoUD	2013	The advisory highlights the need for a habitual change in the waste generator, so that the waste is being stored in two separate bins (biodegradable and recyclable) at source.[352]
Report of the Task Force on Waste to Energy (Volume I), Planning Commission	2014	The report recommends making source segregation mandatory[353] as it underlines the importance of source segregation and encourages efforts to motivate the waste generators to segregate recyclables at source in order for it to be reused in remanufacturing of products and intermediates.[354] An awareness campaign should be launched in order to promote source segregation.[355]

Source: Author's own.

[348] Ministry of Urban Development, *Standing Committee on Urban Development (2008-2009). Fourteenth Lok Sabha. Solid Waste Management. Thirty-Eighth Report*, 81.
[349] Ministry of Finance, *Position Paper on the Solid Waste Management Sector in India*, 40.
[350] Ministry of Urban Development, *Standing Committee on Urban Development (Fourteenth Lok Sabha). Solid Waste Management.*, 35.
[351] Ministry of Environment & Forests, *Report of the Committee to Evolve Road Map on Management of Wastes in India*, 17.
[352] Ministry of Urban Development, *Advisory on Improving Municipal Solid Waste Management Services*, 7.
[353] Planning Commission, *Report of the Taskforce on Waste to Energy 2014*, xxviii.
[354] Ibid., 4.
[355] Ibid., x.

Promotion of Decentralised Community-based Waste Management

The promotion of decentralised community-based waste management is relevant to implementing the waste hierarchy logic. The decentralisation of certain elements of MSWM entails benefits on different levels, as it creates a realm for community-based participation, livelihood generation, social entrepreneurship and innovations. In addition, with decentralisation, MSW gets treated near the origin which reduces long transportation of waste which again reduces costs and possible negative impacts on the environment. The implementation of a decentralised system is especially relevant in the case of the biodegradable fraction, which amounts to more than 50 per cent in the MSW stream, as this, apart from the previously mentioned benefits, also encourages civic responsibility and source segregation.

A few of the relevant government documents in the past decades before 2016 put an emphasis on the need for decentralisation of MSWM facilities and infrastructure. Recommendations for decentralised composting were mentioned twenty years ago. As outlined in Table 6, the Bajaj report of 1995, as well as the 1999 Recommendations for the Modernisation of Solid Waste Management in Class I Cities in India, address the need for decentralised waste management structures in order to deal with the lack of land use planning. Although both reports fed into the framing of the MSW Rules, 2000, the rules do not address community-based waste management systems at any level. Instead of distinguishing between the needs of different areas or cities, the rules focus on capital- and land-intensive centralised arrangements, such as landfill sites, waste-to-energy plants and centralised waste-to-compost facilities, shifting the problem from the source of waste to waste disposal sites.

During the past ten years, between mid 2000s and 2016, the discussion on decentralisation of MSWM has broadened, with recommendations covering the benefits of decentralising waste structures for other MSW fractions, apart from biodegradable, such as plastics. The Advisory on Improving Municipal Solid Waste Management Services published by the MoUD in 2013 identifies the provision of decentralised MSWM facilities as the "(…) real solution to the menace of MSW in India."[356] The Report of the Task Force on Waste to Energy, which was published by the Planning Commission in 2014, encourages a mix of decentralised and centralised waste processing options for MSW. While segregation at source, transportation, pre-processing of wastes, biomethanation, conventional and vermicomposting shall be carried out at a decentralised level, incineration, pyrolysis, gasification,

[356] Ministry of Urban Development, *Advisory on Improving Municipal Solid Waste Management Services*, 21.

RDF production, mechanical composting, C&D waste processing and managing sanitary landfills shall be carried out at a centralised level.

Table 6: Promotion of decentralised waste management

Document	Year	How it addresses aspects of decentralised waste management
Report of the High Power Committee. Urban Solid Waste Management in India, Planning Commission	1995	When addressing the issue of lack of land use planning and waste disposal, the report advocates the planning of decentralised waste management when new townships or colonies are planned.[357]
Recommendations for the Modernization of Solid Waste Management in Class I Cities in India, Supreme Court of India	1999	The report promotes the encouragement of decentralised community-based composting wherever possible.
Report of the Technology Advisory Group on Solid Waste Management, MoUD	2005	The involvement of NGOs in taking up decentralised treatment of waste at the community level, in order to reduce transportation costs of the ULBs is promoted. [358]
National Action Plan for Climate Change, Prime Minister's Council on Climate Change	2008	The NAPCC encourages common regional facilities in order to share treatment facilities and infrastructure.
The Position Paper on Solid Waste Management, MoF	2009	The position paper highlights the need for the community to participate in MSWM in order to make the system effective.[359]
Report of the Committee to Evolve Road Map on Management of Wastes in India, MoEF	2010	The report recommends a decentralised waste management approach to be implemented by plastic manufacturers & processors with a focus on setting up of safe and sustainable common plastic waste management units in community areas or in designated common facility locations.[360]
Advisory on Improving Municipal Solid Waste Management Services, MoUD	2013	The advisory recommends installing recycling plants at local level.

[357] Planning Commission, *Report of the High Power Committee. Urban Solid Waste Management in India*, 2.4.28.
[358] Central Public Health & Environmental Engineering Organisation, "Report of the Technology Advisory Group on Solid Waste Management", 75.
[359] Ministry of Finance, *Position Paper on the Solid Waste Management Sector in India*, 9.
[360] Ministry of Environment & Forests, *Report of the Committee to Evolve Road Map on Management of Wastes in India*, 23.

		It further identifies the provision of decentralised MSWM facilities as the "(…) real solution to the menace of MSW in India."[361] It continues by promoting decentralised waste management, by stating the advantages of decentralised waste management.[362]
Report of the Task Force on Waste to Energy (Volume I), Planning Commission	2014	The report encourages a mix of decentralised (segregation at source, transportation, pre-processing of wastes, biomethanation conventional and vermicomposting) and centralised (incineration, pyrolysis, gasification, RDF production, mechanical composting, C&D waste processing and managing sanitary landfills) processing of MSW.[363]

Source: Author's own.

[361] Ministry of Urban Development, *Advisory on Improving Municipal Solid Waste Management Services*, 21.
[362] Ibid., 22.
[363] Planning Commission, *Report of the Taskforce on Waste to Energy 2014*, xii.

Promotion and Incentivising of Recycling

Recycling of material is one of the five elements of the waste hierarchy concept, which makes the promotion and incentivising of recycling processes two essential features of comprehensive incorporation of the waste hierarchy logic.

Table 7 demonstrates that throughout the past decades, political key stakeholders, such as the MoEF, the MoUD, the MoF and the Planning Commission, have promoted recycling and stressed the need to incorporate strategies for recycling processes. In 1995 itself, the Bajaj report covered essential recycling-enabling elements. The report stresses the need to financially assist industries engaged in recycling to upgrade their technologies for better product quality, less production costs and better marketability of the products. It further highlights the need to undertake research and development in the field of recycling and technologies. In addition, the report recommends introducing legislative and administrative measures to promote consumption of recycled products and incentivising recycling industries from state and central governments in the form of exemption of plant/machinery from taxes and duties. Finally, the report acknowledges the essential role that informal workers play in the recycling economy.[364]

While these aspects have been taken up in later years in other advisories and recommendations, and the voices to incorporate 3R strategies into the legal frame became louder, the MSW Rules, 2000, merely made the municipalities responsible for creating an awareness about recycling among citizens. It was only in 2010 that the MoEF in its Report of the Committee to Evolve Road Map on Management of Wastes in India brought up the idea that a specific policy for the management of wastes in India, incorporating the internationally accepted hierarchy for management of wastes, should be framed. In addition, the report articulated the need to amend the Municipal Solid Waste (Management and Handling) Rules, 2000, to incorporate waste recycling methods.[365]

[364] Planning Commission, *Report of the High Power Committee. Urban Solid Waste Management in India*, 9.
[365] Ministry of Environment & Forests, *Report of the Committee to Evolve Road Map on Management of Wastes in India*, 15.

Table 7: Promotion of recycling

Document	Year	How it addresses aspects of recycling
Report of the High Power Committee. Urban Solid Waste Management in India, Planning Commission	1995	One of the report's recommendations is in relation to resource recovery and recycling. The action plan emphasises that "[r]ecycling should get due recognition and support as a method of converting waste into useful articles; recycling industry should get assistance for technological upgradation to improve the quality of the product, reduce cost and minimize potential health hazards."[366] The report stresses on the need to: 1. Financially assist industries engaged in recycling to upgrade their technologies for better product quality, lower production costs and better marketability of the products 2. Undertake research and development in the field of recycling and technologies 3. Introduce legislative and administrative measures to promote consumption of recycled products 4. Incentivise recycling industries from state and central governments in the form of exemption of plant/machinery from taxes and duties The report further acknowledges the essential role that informal workers play in the recycling economy.
Recommendations for the Modernization of Solid Waste Management in Class I Cities in India, Supreme Court of India	1999	The report stresses the need for the central and state governments as well as union territories to consider incentivising recycling and composting industries. In addition, the 3R principle shall be advocated to the public in order to reduce the burden on the local body and to create awareness.
Municipal Solid Wastes (Management & Handling) Rules, 2000, MoEF	2000	The municipal authority shall promote recycling or reuse of segregated materials among citizens through awareness campaigns.
Report of the Technology Advisory Group on Solid Waste Management, MoUD	2005	The advisory group highlights the need to adopt 3R policies and practice 3Rs in order to handle the growing consumption of paper, plastic and packaging material. It further underlines the need

[366] Planning Commission, *Report of the High Power Committee. Urban Solid Waste Management in India*, 9.

		to give incentives to recycling industry through allotment of land, water, power, tax holiday purchase of recycled goods, etc..[367]
National Action Plan for Climate Change, Prime Minister's Council on Climate Change	2008	The NAPCC puts a strong focus on the importance of recycling of material. Further, it stresses the need for R&D to upgrade plastic waste reycling technologies to reduce occupational and environmental hazards.
CAG	2008	The report recommends that effective strategies for recycling of household waste shall be introduced by the MoEF and the states. Further, the report recommends the prepation of a 3R action plan with defined numerical targets and timelines to achieve it. In addition, the report stresses the importance of creating a market for recycled products by setting standards and laying down guidelines.
The Position Paper on Solid Waste Management, MoF	2009	Recycling is defined as the need of the hour. Recycling targets, so that the majority of waste is recycled, shall be set and met.
Standing Committee on Urban Development (2008–2009). Solid Waste Management, MoUD	2009	"The Committee also feel that there is an urgent need to frame laws to encourage recycling by specifying mandatory deposit and return requirements to shift the burden of waste disposal and recovery of materials back to the manufacturer of products by ensuring that retailers and wholesalers take back materials which is no longer required."[368]
Report of the Committee to Evolve Road Map on Management of Wastes in India, MoEF	2010	A specific policy for the management of wastes in India, incorporating the internationally accepted hierarchy for management of wastes, should be framed. In addition, the Municipal Solid Waste (Management and Handling) Rules, 2000, shall be amended to incorporate waste recycling methods.[369]
Standing Committee on Urban Development (2009–2010). Solid Waste Management, MoUD	2010	"The Committee also feel that there is an urgent need to frame laws to encourage recycling by specifying mandatory deposit and return requirements to shift the burden of waste disposal and

[367] Central Public Health & Environmental Engineering Organisation, "Report of the Technology Advisory Group on Solid Waste Management", 6, 79, 99.
[368] Ministry of Urban Development, *Standing Committee on Urban Development (2008-2009). Fourteenth Lok Sabha. Solid Waste Management. Thirty-Eighth Report*, 79.
[369] Ministry of Environment & Forests, *Report of the Committee to Evolve Road Map on Management of Wastes in India*, 15.

		recovery of materials back to the manufacturer of products by ensuring that retailers and wholesalers take back materials which is no longer required."[370]
Advisory on Improving Municipal Solid Waste Management Services, MoUD	2013	The advisory emphasises the need to implement 3R strategies. In order to recycle, citizens shall be promoted and motivated to segregate at source; mass awareness campaigns shall support this process.[371]
Report of the Task Force on Waste to Energy (Volume I), Planning Commission	2014	The report highlights the implementation of the 5R principles (reduce, reuse, recover, recycle and remanufacture) and stresses on importance of manufacturing products from recyclables.[372]

Source: Author's own.

[370] Ministry of Urban Development, *Standing Committee on Urban Development (Fourteenth Lok Sabha). Solid Waste Management.*, 33–34.
[371] Ministry of Urban Development, *Advisory on Improving Municipal Solid Waste Management Services*, 20–21.
[372] Planning Commission, *Report of the Taskforce on Waste to Energy 2014*, x.

Promotion of Recovery Methods

Recovery of waste is the second least favourable treatment option in the waste hierarchy concept. As mentioned earlier, different waste-to-energy methods have different sets of advantages and disadvantages, depending on the context in which they are being implemented. Until the 2000s, the government's recommendations were limited to methane harvesting from landfills. The MSW Rules, 2000, herald the start of a new era as they encourage MSW processing methods such as incineration with or without energy recovery, including pelletisation. Since the MSW Rules, 2000, do not address comprehensive aspects of the 3R concept, they leave waste-to-energy methods as stand-alone options next to landfilling, therefore only addressing the two least favourable options of the waste hierarchy concept.

In the 2005 Report of the Technology Advisory Group on Solid Waste Management, the MoUD reflects on the advantages and disadvantages of implementing a variety of MSW treatement technologies.

> Local bodies are cautioned to adopt expensive technologies of power generation, fuel pellatization, incineration, etc., until they are proven under Indian condition and Government of India or expert agencies nominated by Government of India advises cities for adopting such technologies. (…) A careful assessment has to be made in each specific case before deciding upon any particular option, duly taking into account the available waste quantities and characteristics and the local condition.[373]

In its 2009 published Position Paper in Solid Waste Management, the Ministry of Finance clearly states that waste management must be solution based and not technology based,[374] confronting the technology-based direction the MoEF had introduced earlier. In 2010, in its Report of the Committee to Evolve Road Map on Management of Wastes in India, the MoEF takes an altered stand in relation to packaging material when it states that "[s]trategies for recovering energy by incineration of packaging waste should be discouraged and banned. Design safer packaging, sorting, separating, reuse, recycling and safe reprocessing should be encouraged and promoted."[375] This turn in the MoEFs understanding of recovery methods is along the lines of the MoUD's understanding of this matter when it states, in 2013 that energy recovery from MSW is an option, "(…) once efforts have been made to minimse waste or recycle and reuse the exisiting waste."[376]

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[373] Central Public Health & Environmental Engineering Organisation, "Report of the Technology Advisory Group on Solid Waste Management", 18–20.
[374] Ministry of Finance, *Position Paper on the Solid Waste Management Sector in India*, 34.
[375] Ministry of Environment & Forests, *Report of the Committee to Evolve Road Map on Management of Wastes in India*, 30.
[376] Ministry of Urban Development, *Advisory on Improving Municipal Solid Waste Management Services*, 13.

Table 8: Promotion of recovery methods

Document	Year	How it addresses aspects of recovery methods
Report of the High Power Committee. Urban Solid Waste Management in India, Planning Commission	1995	The report recommends the implementation of pilot projects for the recovery of methane gas from landfills.
Recommendations for the Modernization of Solid Waste Management in Class I Cities in India**,** Supreme Court of India	1999	The report promotes the idea of methane harvesting.
Municipal Solid Wastes (Management & Handling) Rules, 2000, MoEF	2000	The rules make it mandatory to treat biodegradable waste, adpopting composting or other state of the art technologies or power generation. The rules encourage MSW processing methods such as incineration with or without energy recovery, including pelletisation.
Report of the Technology Advisory Group on Solid Waste Management, MoUD	2005	While the advisory group goes into the details of existing MSW recovery technologies it also clearly points out the existing risks: Local bodies are cautioned to adopt expensive technologies of power generation, fuel pellatization, incineration, etc., until they are proven under Indian condition and Government of India or expert agencies nominated by Government of India advises cities for adopting such technologies. (…) A careful assessment has to be made in each specific case before deciding upon any particular option, duly taking into account the available waste quantities and characteristics and the local condition.[377]
National Action Plan for Climate Change, Prime Minister's Council on Climate Change	2008	The NAPCC puts a strong focus on the developoment of technology for producing power from waste. Further, the NAPCC identifies need for R&D in biomethanation technology for WtE.

[377] Central Public Health & Environmental Engineering Organisation, "Report of the Technology Advisory Group on Solid Waste Management", 18.

Standing Committee on Urban Development (2008–2009). Solid Waste Management, MoUD	2009	"(…) the Committee recommend that the Government should take the desired steps to encourge the State Governments/ULBs to adopt the available and proven technologies for safe disposal of Municipal Solid Waste. At the same time the Committee desire that the Government must also ensure that only environment friendly technological options are adopted so as to prevent further worsening of an already polluted urban environment."[378]
Standing Committee on Urban Development (2009 – 2010). Solid Waste Management, MoUD	2010	"(…) the Committee recommend that the Government should take the desired steps to encourge the State Governments/ULBs to adopt the available and proven technologies for safe disposal of Municipal Solid Waste. At the same time the Committee desire that the Government must also ensure that only environment friendly technological options are adopted so as to prevent further worsening of an already polluted urban environment."[379]
Advisory on Improving Municipal Solid Waste Management Services, MoUD	2013	The advisory highlights the proftiability of composting. It further sees the energy recovery from MSW as an option, once efforts have been made to minimse waste or recycle and reuse the exisiting waste.[380]
Report of the Task Force on Waste to Energy (Volume I), Planning Commission	2014	Biomethanation, vermicomposting, RDF and incineration are identified as appropriate technologies for the Indian MSW context.[381]

Source: Author's own.

[378] Ministry of Urban Development, *Standing Committee on Urban Development (2008-2009). Fourteenth Lok Sabha. Solid Waste Management. Thirty-Eighth Report*, 66.
[379] Ministry of Urban Development, *Standing Committee on Urban Development (Fourteenth Lok Sabha). Solid Waste Management.*, 23.
[380] Ministry of Urban Development, *Advisory on Improving Municipal Solid Waste Management Services*, 11–13.
[381] Planning Commission, *Report of the Taskforce on Waste to Energy 2014*, xiii.

Promotion of Landfill Diversion in Order to Reduce Landfilling

In the waste hierarchy logic, disposal is at the bottom of the inverted pyramid, and therefore the least desirable form of MSW treatment. The discussion around landfill diversion in India has, however, been active since the mid-1990s: while the Bajaj Committee report from 1995 emphasises the acute shortage of land and the rapid increase in urbanisation and the connected need to explore "(…) the possibility of developing methods of solid waste processing, treatment and recycling which will reduce the land requirement substantially"[382], it at the same time identifies landfilling as the preferred option for MSW disposal.[383] When looking at the recommendations mentioned in the Asim Burman Committee report from 1999, one observes a shift in relation to usage of landfills. This report emphasises that "(…) [l]andfilling should be used only as the last step in the waste processing chain, not for untreated mixed wastes. Only rejects should be landfilled, in a scientific manner, once compost plants are set up."[384] The MSW Rules, 2000, build on that recommendation by stating that "[l]and filling shall be restricted to non-biodegradable, inert waste and other waste that is not suitable either for recycling or for biological processing."[385] In the years that followed, strategies and recommendations around 3R strategies and therefore reduction of landfilling became prominent. The task force report of the Planning Commission in 2014 considers it imperative to minimise landfilling by at least 75 per cent through MSW processing, using appropriate technologies and applying the 5R concept. The report goes even so far as to formulate the goal of zero waste going to landfills.[386]

When looking at the reality and the figures for Delhi from 2015 to 2016 in Graph 8, it becomes evident that this goal is still somewhat far away. The format of the inverted pyramid, which usually illustrates the waste hierarchy concept, is in Delhi's case a non-inverted, hence, a right way up pyramid, with disposal being the most frequent option of waste treatment.

382 Planning Commission, *Report of the High Power Committee. Urban Solid Waste Management in India*, 20.
383 Ibid., 4.
384 Supreme Court of India, *Solid Waste Management in Class 1 Cities in India. Report of the Committee Constituted by the Hon. Supreme Court of India*, Chapter 3.15.2.
385 Ministry of Environment & Forests, "Municipal Solid Wastes (Managment and Handling) Rules, 2000", 898.
386 Planning Commission, *Report of the Taskforce on Waste to Energy 2014*, ii.

Table 9: Promotion of landfill diversion

Document	Year	How it addresses aspects of landfill reduction
Report of the High Power Committee. Urban Solid Waste Management in India, Planning Commission	1995	While the report does not directly address landfill diversion aspects, it does emphasise the acute shortage of land and the rapid increase in urbanisation and the connected need to explore "(…) the possibility of developing methods of solid waste processing, treatment and recycling which will reduce the land requirement substantially."[387]
Recommendations for the Modernization of Solid Waste Management in Class I Cities in India**,** Supreme Court of India	1999	"With available land for waste disposal becoming more and more scarce every year, efforts must be made to strictly minimise the wastes going to landfills, by segregating non-biodegradable waste for recycling and by composting of bio-degradable wastes. Landfilling should be used only as the last step in the waste processing chain, not for untreated mixed wastes. Only rejects should be landfilled, in a scientific manner, once compost plants are set up."[388]
Municipal Solid Wastes (Management & Handling) Rules, 2000, MoEF	2000	The rules mention the need for ULBs to adopt suitable processing technologies in order to minimise the burden on landfills. In addition, the rules state that "[l]and filling shall be restricted to non-biodegradable, inert waste and other waste that is not suitable either for recycling or for biological processing. Landfilling shall also be carried out for residues of waste processing facilities as well as pre-processing rejects from waste processing facilities. Landfilling of mixed waste shall be avoided unless the same is found unsuitable for waste processing. Under unavoidable circumstances or till installation of alternate facilities, landfilling shall be done following proper norms. Landfill sites shall meet the specifications as given in Schedule."[389]

[387] Planning Commission, *Report of the High Power Committee. Urban Solid Waste Management in India*, 20.
[388] Supreme Court of India, *Solid Waste Management in Class 1 Cities in India. Report of the Committee Constituted by the Hon. Supreme Court of India*, 3.15.2.
[389] Ministry of Environment & Forests, "Municipal Solid Wastes (Managment and Handling) Rules, 2000", 898.

Report of the Technology Advisory Group on Solid Waste Management, MoUD	2005	The advisory group highlights the need to only dispose rejects and domestic hazardous waste into the landfills, while the organic waste shall be composted, and recyclable waste shall be passed on to the recycling industry in order to react to the scarcity of the availability of land.[390]
CAG	2008	The report highlights the importance of the adoption of a hierarchical approach to waste management. Here it especially stresses the implementation of 3R strategies in order to reduce the waste meant for final disposal.[391]
Report of the Committee to Evolve Road Map on Management of Wastes in India, MoEF	2010	The report highlights the need for efficient and practical collection methods in order to divert MSW from landfills, as it identifies landfilling to be the "(…) most expensive option for solid waste management anywhere in the world."[392] Further, the report recommends that "[l]and filling should be restricted to non-biodegradable/inorganic waste."[393]
Advisory on Improving Municipal Solid Waste Management Services, MoUD	2013	"Improper and unscientific techniques adopted for MSW disposal are economically non-viable and socially unacceptable, due to this selection of proper disposal method is necessary. (…) At present no city in India charges a disposal site fee such as tipping fee etc."[394]
Report of the Task Force on Waste to Energy (Volume I), Planning Commission	2014	The report considers it imperative to minimise landfilling by at least 75 per cent through MSW processing using appropriate technologies and applying the 5R concept. The goal should be zero waste going to landfills.[395]

Source: Author's own.

[390] Central Public Health & Environmental Engineering Organisation, "Report of the Technology Advisory Group on Solid Waste Management", 18.
[391] Comptroller and Auditor General of India, *The CAG Audit on Municipal Solid Waste in India*, 4.
[392] Ministry of Environment & Forests, *Report of the Committee to Evolve Road Map on Management of Wastes in India*, 4.
[393] Ibid., 18.
[394] Ministry of Urban Development, *Advisory on Improving Municipal Solid Waste Management Services*, 15+26.
[395] Planning Commission, *Report of the Taskforce on Waste to Energy 2014*, ii.

Promotion of Informal Waste Workers and Informal MSWM Activities

When considering a comprehensive implementation of the waste hierarchy logic in MSWM agenda setting, one has to recognise and analyse the Indian context. The existence and presence of an estimated 1.5 million active informal workers[396] in the MSWM system makes it necessary to recognise waste workers for what they are and what they contribute to the MSW setting. Therefore, an examination of, and serious engagement with, informal waste workers and their activities as a point of departure is already inevitable. Considering the incorporation of promotive aspects, which are beneficial, or at least not harmful for informal waste workers, into the legal framework is another necessary step.

The 1995 published Bajaj report recognises the contribution of informal waste workers, especially in the recycling sector. Moreover, the report emphasises that "(…) the rag pickers [shall] get due financial reward for their work."[397] The 1999 published Asim Burman Committee recommends that NGOs be encouraged to organise waste pickers for door-to-door collection, and local bodies should consider the important role of waste workers in reducing waste and the cost to the local body in transportation of such waste. The report moreover recommends that local bodies financially support the NGOs and cooperatives to provide equipment to the waste workers for more efficient performance. Both the reports touch upon essential elements surrounding debates around informal waste workers, such as their essential role in the MSW reycling sector, the lack of recognition and the position of waste workers in society, as well as potential ways to promote the waste workers' acitivities.

When analysing different government documents, it becomes evident that although it is widely believed that the major recommendations of the Asim Burman Committee had been incorporated in the MSW Rules, 2000, one of the essential recommendations, of both the Bajaj report as well as the Asim Burman Committee report—to acknowledge and structure the important contribution of informal workers in the context of MSWM—has been neglected when phrasing the MSW Rules, 2000. It is the National Environment Policy in 2006 which incorporates in its action plan to "[g]ive legal recognition to, and strengthen the informal sector systems of collection and recycling of various materials. In particular enhance

396 Chintan, "Scavengers to Managers", Chintan Environmental Research and Action Group, http://www.chintan-india.org/initiatives_scavengers_to_managers.htm (last accessed April 9, 2019); Rajanya Bose and Anirban Bhattacharya, "Why Ragpickers, Unrecognised and Unpaid, Are Critical for Waste Management in India", *IndiaSpend*, May 12, 2017, https://archive.indiaspend.com/cover-story/why-ragpickers-unrecognised-and-unpaid-are-critical-for-waste-management-in-india-43164 (last accessed April 9, 2019).

397 Planning Commission, *Report of the High Power Committee. Urban Solid Waste Management in India*, 9.

their access to institutional finance and relevant technologies."[398] At a waste management event in New Delhi in 2015, the then Environment minister Prakash Javadekar stated: "There are millions of rag pickers in the country. This informal sector has saved the country. They are doing a great job and I have decided to recognise their effort. We will grand national award."[399] The award was connected to a sum of money which was suppose to be paid to three waste workers and three associations involved in innovate waste management solutions. While this award would have a monetary and also symbolic value, in the course of this research, it was not possible to find out if this award materialised in the years after the announcement. A variety of other government documents thereafter address the importance of recognising the role of informal waste workers, especially in the field of recycling, in order to be able to organise the workers in a better way and improve their living conditions. Once the informal sector/waste workers are acknowledged, synergies with the formal waste management chain can be created, and the impact of the informal waste sector can be utilised effectively for the ULBs.

[398] Ministry of Environment & Forests, "National Environment Policy 2006", 39.
[399] "Now, a National Award for Rag Pickers", *The Hindu*, July 3, 2015, https://www.thehindu.com/sci-tech/energy-and-environment/rag-pickers-services-will-be-recognised-by-government-to-give-national-award/article7382780.ece (last accessed May 3, 2019).

Table 10: Promotion of informal waste workers and informal MSWM activities

Document	Year	How it addresses aspects of informal waste workers promotion
Report of the High Power Committee. Urban Solid Waste Management in India, Planning Commission	1995	The report recognises the contribution of informal waste workers, especially in the recycling sector. It further stresses the need to organise them into cooperatives and to either construct ward level recovery centers or to integrate the informal workers into the formal municipal solid waste management system. Moreover, the report emphasises that "(…) the rag pickers [shall] get due financial reward for their work."[400]
Recommendations for the Modernization of Solid Waste Management in Class I Cities in India**,** Supreme Court of India	1999	The report recommends that NGOs may be encouraged to organise waste pickers for door-to-door collection, and it further recommends that local bodies consider the important role of rag pickers in reducing the waste and the cost to the local body in transportation of such waste. The report moreover recommends that local bodies tfinancially support the NGOs and cooperatives to provide equipment to the waste workers for more efficient performance.
Report of the Technology Advisory Group on Solid Waste Management, MoUD	2005	The report acknowledges the critical role informal waste workers play in waste management, and encourages ways to organise the sector and promote and develop informal recycling groups as a means of upgrading living and working conditions of ragpickers.[401]
National Environment Policy, MoEF	2006	"Give legal recognition to, and strengthen the informal sector systems of collection and recycling of various materials. In particular enhance their access to institutional finance and relevant technologies."[402]
National Action Plan for Climate Change, Prime Minister's Council on Climate Change	2008	The NAPCC recognises the important role of waste workers, especially in the recycling field, and states that "(…) while the informal recycling sector is the backbone of India's highly effective recycling system, unfortunately, a number of municipal regulations

[400] Planning Commission, *Report of the High Power Committee. Urban Solid Waste Management in India*, 9.
[401] Central Public Health & Environmental Engineering Organisation, "Report of the Technology Advisory Group on Solid Waste Management", 71.
[402] Ministry of Environment & Forests, "National Environment Policy 2006", 39.

		impede the operation of the recyclers, owing to which they remain at a tiny scale without access to finance or improved recycling technologies."[403]
CAG	2008	"MOEF/states should consider providing legal recognition to rag pickers so that recycling work becomes more organized and also ensure better working conditions for them."[404]
Standing Committee on Urban Development (2008–2009). Solid Waste Management, MoUD	2009	"The Committee would like to urge the authorities to ensure that not only the waste handling municipal staff but the rag pickers in unorganized sector, who are reported to be about 1.3 lakh in number and play a special role in segregation of waste, should also be provided with the adequate protective equipment and health checkup including other incentives like identity cards and use of public sanitation services."[405]
Report of the Committee to Evolve Road Map on Management of Wastes in India, MoEF	2010	The report recommends giving due attention to the safety of workers and rag pickers associated with waste handling. In addition, the report acknowledges a clear role of the informal waste workers in the collection phase of the waste management system.[406]
Standing Committee on Urban Development (2009–2010). Solid Waste Management, MoUD	2010	"The Committee would like to urge the authorities to ensure that not only the waste handling municipal staff but the rag pickers in unorganized sector, who are reported to be about 1.3 lakh in number and play a special role in segregation of waste, should also be provided with the adequate protective equipment and health checkup including other incentives like identity cards and use of public sanitation services."[407]
Plastic Waste (Management and Handling) Rules, 2011, MoEF	2011	The rules state that the municipalities shall be responsible for engaging "(…) agencies or groups working in waste management including waste pickers."[408]

[403] Prime Minister's Council on Climate Change, *National Action Plan for Climate Change 2008*, 30.
[404] Comptroller and Auditor General of India, *The CAG Audit on Municipal Solid Waste in India*, 41.
[405] Ministry of Urban Development, *Standing Committee on Urban Development (2008-2009). Fourteenth Lok Sabha. Solid Waste Management. Thirty-Eighth Report*, 77.
[406] Ministry of Environment & Forests, *Report of the Committee to Evolve Road Map on Management of Wastes in India*, 16–17.
[407] Ministry of Urban Development, *Standing Committee on Urban Development (Fourteenth Lok Sabha). Solid Waste Management.*, 31.
[408] Ministry of Environment & Forests, "Plastic Waste (Management and Handling) Rules, 2011", (New Delhi: Government of India 2011), 6.c.vi.

Advisory on Improving Municipal Solid Waste Management Services, MoUD	2013	The advisory acknowledges the important role the informal waste workers play in the waste economy and encourage local bodies to "(…)extending financial help to NGOs and co-operatives in providing some tools and equipment to the rage pickers for efficient performance of their work in the informal sector."[409] Moreover, the advisory recommends to hand out identity cards to informal waste workers in order for them to have a higher acceptability in the society.
Report of the Task Force on Waste to Energy (Volume I), Planning Commission	2014	The report highlights the need to integrate informal waste workers into the MSWM system. Here the report focusses on strategies to recognise and strengthen the informal workers as this is essential in order to efficiently utilise untapped resources.[410]
Swachh Bharat Mission Guidelines, MoUD	2014	The guidelines advise the ULBs to give priority to the upgrade of the working conditions of the informal waste workers and to integrate them in the formal system of SWM in cities.[411]

Source: Author's own.

[409] Ministry of Urban Development, *Advisory on Improving Municipal Solid Waste Management Services*, 7.
[410] Planning Commission, *Report of the Taskforce on Waste to Energy 2014*, x, xi.
[411] Ministry of Housing and Urban Affairs, *Guidelines for Swachh Bharat Mission - Urban* (New Delhi: Government of India, 2017) 10–11.

Promotion of Policy and Economic Instruments

The introduction of policy and economic instruments for sustainable MSWM has two main objectives: while these instruments and schemes ensure the financial coverage and sustainability of MSW services, they also have an impact on behaviour as they draw on pricing mechanisms which eventually influence behaviour in accordance with the principles of the waste hierarchy concept. The application of economic instruments especially feeds into increased waste reduction, strengthened recycling processes and increased landfill diversion. Therefore, the existing instruments fall into two broad groups: one, in order to cover MSWM costs, cost recovery instruments such as user charges or taxes are being applied. Second, in order to incentivise waste reduction and recycling processes, instruments such as product fees, deposit-refund systems, taxes or tax reductions, EPR schemes, product stewardship and recycling fees are being applied.[412]

As earlier mentioned, the recommendations for promotion of policy and economic instruments in the MSWM debate started more than twenty years ago. The Bajaj report recommends that the "(…) industries and product manufacturers should include the cost of appropriate disposal of product/packaging material as a part of the cost of the product. Individuals and industries may be subjected to a disposal tax for part generation of resources for solid waste management."[413] Also, the recommendations in the Asim Burman report from 1999 highlight the need for taxes, user charges and fees that should be raised in order to effectively supply MSWM services.[414] The MSW Rules, 2000, do not include aspects related to the promotion of policy and economic instruments. It is only in recent years, from 2008 onwards that the debate around certain policy and economic instruments has started to gain importance in the MSWM context. As outlined in Table 11, government documents since 2008 cover the importance of instruments such as deposit refund schemes for reduction of waste at source, incentive schemes for the introduction of cleaner technology, products stewardship and extended producer responsibility to minimise the waste being produced, landfill tipping fees and solid waste management tax.

Economic instruments aiming at landfill diversion, such as taxes on landfilling or landfill fees, are particularly interesting in the case of India. In 2016, the idea of a landfill tax, while

412 Ellen Gunsilius, *Economic Instruments in Solid Waste Management: Applying Economic Instruments for Sustainable Solid Waste Management in Low-and Middle-Income Countries* (Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, 2015).
413 Planning Commission, *Report of the High Power Committee. Urban Solid Waste Management in India*, 7.
414 Supreme Court of India, *Solid Waste Management in Class 1 Cities in India. Report of the Committee Constituted by the Hon. Supreme Court of India*, 22.

being widely discussed, was not yet introduced. This is despite the fact that the introduction of landfill fees or landfill taxes—both globally used instruments—serves as an incentive to divert MSW from landfills as alternative treatment options, such as recycling or reuse, become cheaper in comparison. And while a tipping fee at landfills has been introduced, it has been introduced the other way around: waste management companies do not need to pay a landfill fee in accordance with a given quantity of waste disposed at the landfill, but instead, the waste management companies receive a 'tipping fee' once they dispose MSW in the landfills, leading to a scenario in which the bigger the MSW quantity disposed, the higher the financial reward.[415]

[415] Sunita Narain, "Sunita Narain: In Need of a Landfill Tax", *Business Standard*, May 8, 2016, https://www.business-standard.com/article/opinion/sunita-narain-in-need-of-a-landfill-tax-116050800663_1.html (last accessed April 10, 2019).

Table 11: Promotion of policy and economic instruments

Document	Year	How it addresses aspects of policy and economic instruments for MSWM
Report of the High Power Committee. Urban Solid Waste Management in India, Planning Commission	1995	The report recommends that the "(…) industries and product manufacturers should include the cost of appropriate disposal of product/packaging material as a part of the cost of the product. Individuals and industries may be subjected to a Disposal Tax for part generation of resources for solid waste management."[416] In addition, industries should be given a bigger role in creating awareness on MSWM by providing tax incentives.
Recommendations for the Modernization of Solid Waste Management in Class I Cities in India**,** Supreme Court of India	1999	The report highlights the need for taxes, user charges and fees that should be raised.[417]
Report of the Technology Advisory Group on Solid Waste Management, MoUD	2005	The advisory group recommends the introduction of user charges and tipping fees for the disposal of waste. In addition, the report recommends the introduction of fines for littering, and underlines the need to provide incentives for the installation of compost plants and for the recycling industry through allotment of land, water and power.[418]
National Action Plan for Climate Change, Prime Minister's Council on Climate Change	2008	Encouragement to introduce user charges.
CAG	2008	The report recommends the introduction of Environmentally Preferred Purchases to promote the purchase of eco-friendly goods, and that the MoEF should include more products under the 'ECOMARK' scheme. The 'polluter pays principle' should be included in the waste rules/legislations itself. The report further recommends the need for the MoEF and the states to consider introducing (a) deposit refund schemes for

[416] Planning Commission, *Report of the High Power Committee. Urban Solid Waste Management in India*, 7.
[417] Supreme Court of India, *Solid Waste Management in Class 1 Cities in India. Report of the Committee Constituted by the Hon. Supreme Court of India*, 22.
[418] Central Public Health & Environmental Engineering Organisation, "Report of the Technology Advisory Group on Solid Waste Management", 46+79.

		reduction of waste at source, and (b) incentive schemes for the introduction of cleaner technology, remanufacturing, reuse of scrap materials for the reudction of waste at source. In addition to this, the report recommends that the MoEF and states consider encouraging big manufacturers to introduce eco audits, life-cycle analysis, products stewardship/extended producer responsibility to minimise the waste being produced.[419]
Report of the Committee to Evolve Road Map on Management of Wastes in India, MoEF	2010	The report recommends encouraging and promoting the design of safer packaging, sorting, separating, reuse, recycling, and safe reprocessing should be encouraged and promoted. The responsibilities of manufacturers and processors are clearly outlined as: 1. "Paying for both recyclable & non-recyclable plastics and their ultimate waste management options 2. (…) 3. Undertaking mandatory responsibility of producers for R&D activities on plastic waste mitigation. 4. Undertaking R&D for developing truly safe and biodegradable polymers like food grade linings in cardboard cartons etc. made from tapioca starch or other such food-based starch so that along with biodegradability, the polymer technology will also evolve into a complete safe packaging option for the consumers."[420] Provision of incentives and disincentives to local bodies to promote better implementation for the rules may be formulated in a scheme.
Plastic Waste (Management and Handling) Rules, MoEF	2011	"The municipal authority may work out the modalities of a mechanism based on Extended Producer's Responsibility involving such manufacturers, registered within it's jurisdiction and brand owners with registered offices within its jurisdiction either

[419] Comptroller and Auditor General of India, *The CAG Audit on Municipal Solid Waste in India*, 38.
[420] Ministry of Environment & Forests, *Report of the Committee to Evolve Road Map on Management of Wastes in India*, 23.

		individually or collectively, as feasible or set up such collection systems through its own agencies."[421]
Advisory on Improving Municipal Solid Waste Management Services, MoUD	2013	The advisory recommends that municipalities may implement levying user charges (along the lines of those who pollute more pay more) and/or solid waste management tax.[422] In a decentralised MSWM system, the concept of community-based 'pay & use' facilities may be promoted and offer livelihood opportunities for the urban poor. [423] The advisory recommends levying a dedicated tariff for solid waste services, which should be based on the frequency of service, volume/weight of the waste or combination of both, or on family basis. [424] Promotion of disposal site fee such as tipping fee.[425]
Report of the Task Force on Waste to Energy (Volume I), Planning Commission	2014	The report promotes the introduction of levying a user/service fee.

Source: Author's own.

[421] Ministry of Environment & Forests, "Plastic Waste (Management and Handling) Rules, 2011", 6.d.ii.
[422] Ministry of Urban Development, *Advisory on Improving Municipal Solid Waste Management Services*, 19.
[423] Ibid., 21.
[424] Ibid., 23.
[425] Ibid., 26.

4.2.2. The Waste Hierarchy Logic in the SWM Rules, 2016

The Solid Waste Management Rules, 2016, touch upon all seven identified aspects that function as prerequisites for comprehensive incorporation of the waste hierarchy logic. Some aspects, such as source segregation and promotion of recovery processes, get more attention in the rules than other aspects, such as. promotion of decentralisation and recycling processes. As outlined in Table 12, waste generators are mandated to segregate the produced waste at source, which is an essential prerequisite for a functioning and sustainable MSWM system. However, the rules do not specify how the mandate of segregation at source by the citizen will be ensured.

In regard to the decentralisation of MSWM systems and appropriate treatment methods in MSW, the rules adopt a two-pronged approach: on the one hand, the rules put an emphasis on the role of ULBs in promotion and facilitation of decentralised processes such as biomethanation, microbial composting, vermicomposting, anaerobic digestion or any other appropriate processing for bio-stabilisation of biodegradable wastes. The rules stress decentralised community-based MSWM and town planning, especially decentralised composting, as local authorities should involve communities in waste management and promotion of home composting, biogas generation, decentralised processing of waste at community level, and the Department of Fertilisers of the Ministry of Chemicals and Fertilisers shall ensure promotion of co-marketing of compost. On the other hand, the rules strongly emphasise centralised treatment processes by stating that the MoUD shall formulate a policy on WtE and the Ministry of New and Renewable Energy Sources shall facilitate infrastructure creation for WtE plants, and also provide appropriate subsidy or incentives for such WtE plants. In addition, the rules highlight the ULB's role in promotion and facilitation of WtE processes.[426]

Although the overall rules emphasise waste reduction, reuse, recycling, recovery and optimum utilisation of various components of solid waste to ensure minimisation of waste going to landfills, and achievement of the objective of zero waste to landfills, promotion of recycling methods or landfill diversion goals are limited in the rules. In regard to recycling, the rules highlight the need for developers of Special Economic Zones, Industrial Estate and Industrial Park to earmark at least 5 per cent of the total area of the plot, or a minimum of five plots or sheds for recovery and recycling facility. The rules further address manufacturers

[426] Ministry of Environment, "Solid Waste Management Rules, 2016", 4(6), 6(b), 7(b), 10(a,b), 15 (t,v).

of sanitary napkins and diapers to explore the possibility of using all recyclable materials in their products. Moreover, the CPCB is to introduce performance standards for recycling.[427]

One of the major changes in comparison to the MSW Rules, 2000, is that the 2016 rules acknowledge the primary role of informal waste workers in the MSWM system. The rules lay emphasis on acknowledging the work of informal workers and underline the need for broad state-level guidelines regarding integration of waste pickers or informal waste collectors in the waste management system. In addition, the rules highlight the need for waste pickers and waste dealers to be registered. Here, the rules transfer the duties to the ULBs: local authorities shall establish a system to recognise organisations of waste pickers or informal waste collectors and promote and establish a system for integration of these authorised waste pickers and waste collectors to facilitate their participation in solid waste management, including door-to-door collection of waste. Further, ULBs shall facilitate the formation of self-help groups and provide identity cards. Local authorities shall set up material recovery facilities or secondary storage facilities with sufficient space for sorting of recyclable materials to enable informal or authorised waste pickers and waste collectors to separate recyclables from the waste and provide easy access to waste pickers and recyclers for collection of segregated recyclable waste from the source of generation or from material recovery facilities. Recycling initiatives of informal waste workers shall be incentivised, and the ULBs shall provide training on solid waste management to waste pickers and waste collectors. [428]

The promotion of policy and economic instruments is limited to a few aspects: the rules introduce a possible implementation of user fees from waste generators, which would be set according to the by-laws of the respective local body. It is not clear though, why user fees shall only be prescribed "(…) from time to time (…)"[429] by the ULBs. Manufacturers or brand owners of disposable products and sanitary napkins and diapers are being addressed, as they will put in place a collect-back system for packaging waste of products which are packed in non-biodegradable packaging material. [430]

Although all the seven aspects feeding into the waste hierarchy concept have been addressed in the Rules, 2016, ensuring the enforcement and monitoring of rules is vague and not dealt with in detail.

[427] Ibid., 11(b)(i), 14(e), 17(3).
[428] Ibid., 11 (a,c,m), 15(c,d,h,l,u).
[429] Ibid.
[430] Ibid., 4(3), 15(f), 17(2).

Table 12: Aspects of the waste hierarchy logic in SWM Rules, 2016

Promotion of source segregation	The waste generator is mandated to source segregate in biodegradable, non-biodegradable (recyclable and combustible) and domestic hazardous wastes.[431] The ULBs shall create awareness on practice segregation.[432]
Promotion of decentralised community-based MSWM	Emphasis on decentralised community-based MSWM, especially decentralised composting, as local authorities shall involve communities in waste management and promotion of home composting, biogas generation, decentralised processing of waste at community level.[433] In gated communities and institutions with more than 5,000 sqm area and all hotels and restaurants: The biodegradable waste shall be processed, treated and disposed of through composting or bio-methanation within the premises as far as possible.[434] Town planning to ensure decentralised infrastructure for segregation, storage and processing.[435] The ULBs to create public awareness on home composting, vermicomposting, biogas generation or community level composting.[436]
Promotion and incentivising of recycling	Secretary-in-charge, Urban Development in the States and Union Territories shall develop state policy and strategy on solid waste management with emphasis on waste reduction, reuse, recycling, recovery and optimum utilisation of various components of solid waste to ensure minimisation of waste going to landfills. Further, the developers of Special Economic Zones, Industrial Estate and Industrial Park to earmark at least 5 per cent of the total area of the plot, or a minimum of five plots or sheds, for recovery and recycling facility.[437] Manufacturers or brand owners or marketing companies of sanitary napkins and diapers shall explore the possibility of using all recyclable materials in their products.[438] The ULBs may provide incentives to recycling initiatives of the informal waste recycling sector.[439] The CPCB to introduce performance standards

[431] Ibid., 4(1)(a).
[432] Ibid., 15(zg).
[433] Ibid., 4(6), 15(t).
[434] Ibid., 4(7,8).
[435] Ibid., 11(h).
[436] Ibid., 15(v).
[437] Ibid., 11(b,i).
[438] Ibid., 17(3).
[439] Ibid., 15(u).

	for recycling.[440]
Promotion of recovery methods	Emphasis on the role of ULBs in promotion and facilitation of bio-methanation, microbial composting, vermicomposting, anaerobic digestion or any other appropriate processing for bio-stabilisation of biodegradable wastes;[441] Department of Fertilisers, Ministry of Chemicals and Fertilisers shall provide market development assistance on city compost.[442] Ministry of Agriculture shall provide flexibility in Fertiliser Control Order for manufacturing and sale of compost.[443] Local authorities shall phase out the use of chemical fertiliser in two years and use compost.[444] Emphasis on the role of ULBs in promotion and facilitation of WtE processes, including refuse-derived fuel for the combustible fraction of waste or supply as feedstock to solid waste based power plants or cement kilns;[445] The MoUD shall formulate policy on WtE.[446] Ministry of power shall compulsorily purchase power generated from such WtE plants by distribution companies.[447] Ministry of New and Renewable Energy Sources shall facilitate infrastructure creation for waste to energy plants.[448] The CPCB to introduce performance standards and emission norms[449]
Promotion of landfill diversion	State policy and strategy on solid waste management shall put emphasis on implementation of waste hierarchy concept to ensure minimisation of waste going to landfills.[450] Local authorities shall allow only the non-usable, non-recyclable, non-biodegradable, non-combustible and non-reactive inert waste and pre-processing rejects

[440] Ibid., 14(e).
[441] Ibid., 15(v).
[442] Ibid., 7(a).
[443] Ibid., 8(a-d).
[444] Ibid., 15(u).
[445] Ibid., 15(v).
[446] Ibid., 6(b).
[447] Ibid., 9(b).
[448] Ibid., 10(a).
[449] Ibid., 14(e).
[450] Ibid., 11(b).

	and residues from waste processing facilities to go to sanitary landfills. Efforts shall be made to adopt the zero-waste concept.[451]
Promotion of informal waste workers	Informal waste workers are acknowledged. Waste pickers shall be involved to prepare a state policy and solid waste management strategy for the state, in which the primary role played by the informal sector of waste pickers, waste collectors and recycling industry in reducing waste shall be acknowledged, and broad guidelines regarding integration of waste pickers or informal waste collectors in the waste management system shall be provided.[452] Waste pickers and waste dealers shall be registered.[453] Local authorities shall establish a system to recognise organisations of waste pickers or informal waste collectors, and promote and establish a system for integration of these authorised waste pickers and waste collectors to facilitate their participation in solid waste management—including door to door collection of waste;[454] The ULBs shall facilitate formation of self-help groups, provide identity cards, and thereafter encourage integration in solid waste management, including door to door collection of waste;[455] Segregated waste shall be handed over to authorised waste pickers.[456] Local authorities shall set up material recovery facilities or secondary storage facilities with sufficient space for sorting of recyclable materials to enable informal or authorised waste pickers and waste collectors to separate recyclables from the waste, and provide easy access to waste pickers and recyclers for collection of segregated recyclable waste such as paper, plastic, metal, glass, textile from the source of generation or from material recovery facilities;[457] The ULBs shall provide training on solid waste management to waste pickers and waste collectors.[458]

[451] Ibid., 15(zi).
[452] Ibid., 11(a,c).
[453] Ibid., 11(m).
[454] Ibid., 15(c).
[455] Ibid., 15(d).
[456] Ibid., 4(1)(a).
[457] Ibid., 15(h).
[458] Ibid., 15(l).

Promotion of policy and economic instruments	Emphasis on user fee from waste generators, as specified in the by-laws of the respective local bodies.[459] Local authorities shall incentivise recycling initiatives by the informal waste recycling sector.[460] Manufacturers of disposable products such as tin, glass, plastics, packaging etc. shall provide necessary financial assistance to local authorities for establishment of waste management system.[461] Manufacturers or brand owners of disposable products and sanitary napkins and diapers who sell or market their products in non- biodegradable packaging material shall put in place a system to re-collect the packaging waste generated by their production.[462] Department of Fertilisers, Ministry of Chemicals and Fertilisers shall ensure promotion of co-marketing of compost.[463] Ministry of New and Renewable Energy Sources shall provide appropriate subsidy or incentives for such WtE plants.[464]

Source: Author's own.

[459] Ibid., 4(3), 15(f).
[460] Ibid., 15(u).
[461] Ibid., 17(l).
[462] Ibid., 17(2).
[463] Ibid., 7(b).
[464] Ibid., 10(b).

4.3. Integration of the Waste Hierarchy Concept in the SWM Rules, 2016—Challenges and Opportunities

The SWM Rules, 2016, acknowledge the waste hierarchy concept and emphasise implementation of the waste hierarchy elements.[465] The different aspects of the waste hierarchy concept are being addressed in varying intensity throughout the rules, while at the same time, the integration of the waste hierarchy concept or elements thereof in the MSW agenda setting poses a set of challenges and opportunities for the country's MSW system.

4.3.1. Integration of the Waste Hierarchy Concept in the SWM Rules, 2016

The rules address all five elements of the waste hierarchy concept, and while the three more favourable elements of the waste hierarchy—reduction, reuse and recycling—require a framework which can be characterised by a mix of preventive and 3R policies, the elements of recovery and disposal can be framed by end-of-pipe policies. In order to understand how far the SWM Rules, 2016, feed into an enabling framework for the waste hierarchy concept, it is important to analyse the rules and identify the mix of aspects which relate to either preventive, 3R or end-of-pipe policies.

Figure 4 outlines the features in the SWM Rules, 2016, which enable a policy frame in which the waste hierarchy concept can be implemented. While the rules, as mentioned before, acknowledge the waste hierarchy concept and include a definition of the same, it is evident, when looking at Figure 4 that the five elements of the waste hierarchy concept receive different degrees of attention.

The reduction of waste, as the most favourable element of the inverted pyramid, is being addressed by emphasising the need for ULBs to put in place awareness campaigns for waste generators and introduce user fees in respective by-laws. While both these aspects are relevant, the rules do not specify a timeline by which the ULBs should establish an awareness campaign or guidelines for the same. The rules also do not specify a structure for the introduction of the user fees— user fees flat rate versus user fees that vary according to the quantity of waste or other aspects. Moreover, the rules state that the fees shall be prescribed "(…) from time to time (…)"[466], which leaves this policy mechanism very vague. The SWM Rules, 2016, therefore only include policies that target the root cause of the continuously rising MSW generation. Preventive policies at the front-end of the product lifecycle and 3R policies

[465] Ibid., 11(b).
[466] Ibid., 15(f).

for reduction, such 'pay-as-you-throw' schemes, which clearly specify a relation between the quantity of waste and the amount which is being paid, as also policies related to eco-design, for instance, are not being covered.

When looking at the formulated rules and the attention which has been given to reuse, it is noticeable that this element of the waste hierarchy has been addressed the least in the overall rules of 2016. The reuse of material is mentioned as part of the overall strategy to incorporate a stronger 3R approach in MSWM. Apart from that, the rules mandate that ULBs create awareness in order for the waste generator to "(…) reuse the waste to the extent possible." [467] While this mandate in relation to reuse is very vague and does not specify any further enforcement, monitoring or economic mechanisms, such as incentives or penalties, it also is the only time the rules address the element of reuse. The rules do not include enabling aspects such as promotion of markets for reused goods or introduction of certification of reused products.

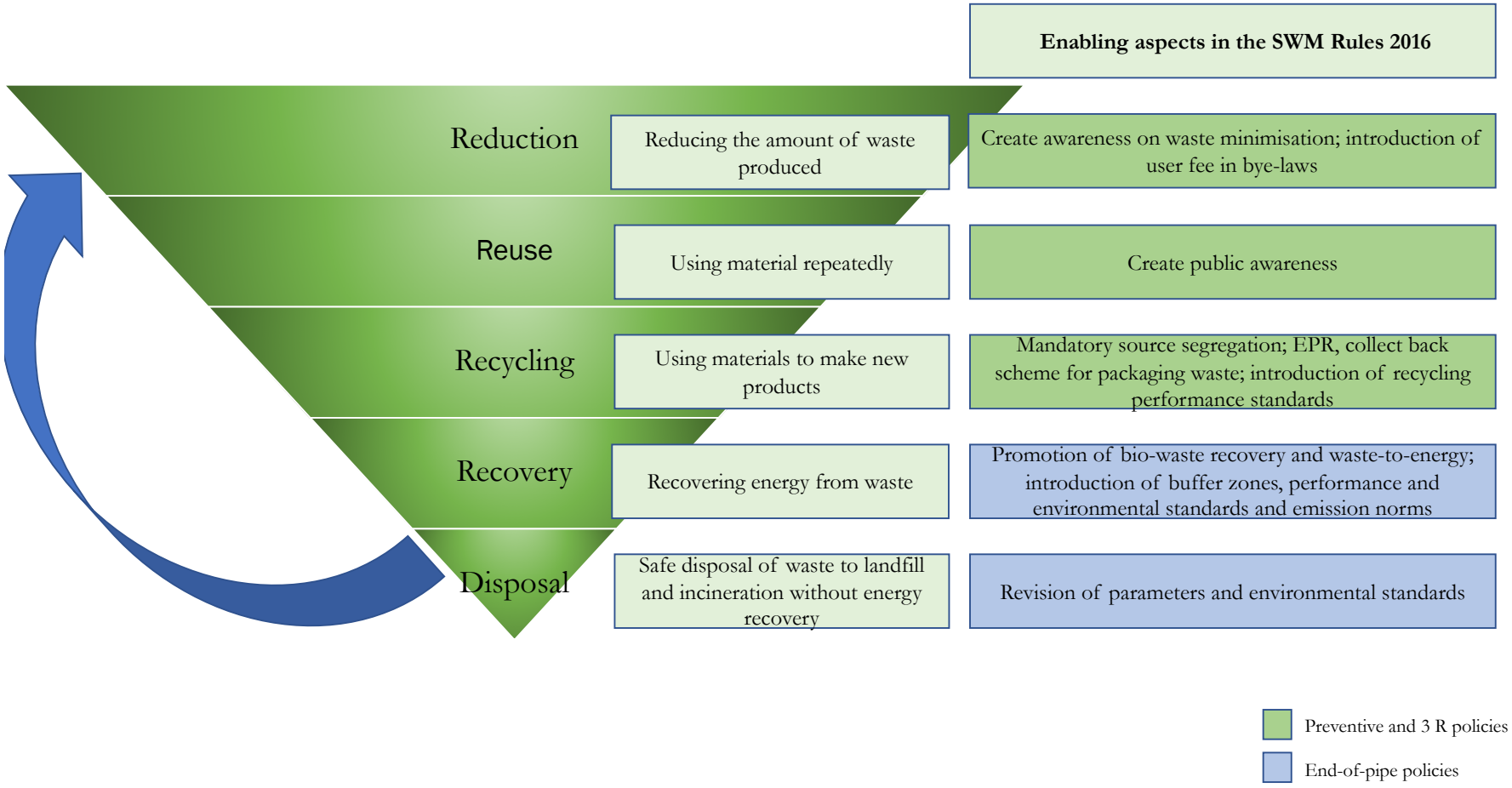
In relation to recycling, the SWM Rules, 2016, encompass a broader range of enabling aspects. The rules introduce mandatory source segregation, which assigns an important role to the waste generator, as this is an essential prerequisite for recycling. In addition to this, the rules transfer recycling related duties to the CPCB and the manufacturers of products. The CPCB shall "(…) review the proposals of State Pollution Control Boards or Pollution Control Committees on use of any new technologies for (…) recycling (…) of solid waste and prescribe performance standards, emission norms for the same within 6 months." [468] The introduction of performance standards in the recycling sector is an important step. However, the rules do not specify the consequences when standards are not met, and the enforcement mechanisms are yet again vague. Besides the CPCB, the manufacturers also have duties related to recycling. The rules mandate that manufacturers introduce a system for a collect back scheme for packaging waste,[469] introducing EPR in the MSWM system. In addition, manufacturers of sanitary napkins and diapers shall "(…) shall explore the possibility of using all recyclable materials in their products." [470] One more aspect is the promotion of informal recycling initiatives by ULBs providing incentives to the informal waste recycling sector.[471] The combination of introducing source segregation, recycling performance standards, EPR and incentivising the informal recycling activities is a positive signal by the government towards improvement of the existing recycling system. However, a framework including

[467] Ibid., 15(zg), (iii).
[468] Ibid., 14(e).
[469] Ibid., 17(2).
[470] Ibid., 17(3).
[471] Ibid., 15(u).

industry targets for recycling, introduction of certification and ensuring waste is used as a raw material would further enable and foster a 3R driven approach in MSWM.

The end-of-pipe policies related to recovery and disposal encompass the promotion of bio-waste recovery and waste-to-energy processes. In addition, the rules introduce buffer zones around recovery facilities, as well as performance and environmental standards and emission norms. The safe disposal of waste is being promoted with a more specified revision of parameters and environmental standards. The reduction of biodegradable disposal in landfills is being addressed, but targets for this are not mentioned. And, although the definition of a tipping fee is being introduced in the beginning of the rules, the rules do not address this instrument in the later part.

Figure 4: Aspects of an enabling policy framework for the implementation of the waste hierarchy concept in India's SWM Rules, 2016



Source: Author's own, based on the waste hierarchy concept.

4.3.2. Challenges and Opportunities of Integrating the Waste Hierarchy Concept in India's MSW Policy Framework

The integration of the waste hierarchy concept or elements thereof in the MSW agenda setting poses a set of challenges and opportunities for the country's MSW system. As outlined in Figure 5, each of the aspects which are mentioned in the SWM Rules, 2016, and relate to one of the five stages of the waste hierarchy, entail a set of challenges (but also opportunities) for the overall MSW economy and all stakeholders involved.

Reduction

The reduction of waste is closely linked to the manufacturing of a product. While a green design can increase a product's durability, reparability, upgradability and recyclability, this idea has not yet been mainstreamed into the Indian product market. One of the main challenges of a reduction-enabling policy framework is that the interests of producers, consumers and recyclers are not aligned. A key factor in this is the product price, as it affects customers' purchasing decisions: a market in which the price of a green product is at minimum competitive if not below a non-green product enables reduction of waste as it sensitises and fosters environmentally responsible consumers. Another opportunity lies in incentivising manufacturers of green production in order to promote eco-design, and consequently decrease the pressure on the finite supply of natural resources, or, in introducing guarantees in order to contribute to the durability of a product.

Reuse

The challenges of a reuse-enabling policy framework include the labour intensity of using material repeatedly in combination with the partially recognised informal waste workers. The reuse of material, which would otherwise become waste, has benefits in the social, economic and environment realms, as it creates jobs and makes products available to consumers who might not be able to afford to buy a new product. A reuse-enabling policy framework can therefore contribute to India's jobs and social agenda. The pricing of reused goods involves challenges as well as opportunities: once the price of a product reflects the environmental costs, the market for reused goods increases. A reuse-enabling policy framework involves the opportunity to provide incentives or use economic instruments such as taxation in order to affect customers' purchasing decisions.

Recycling

The challenges of India's enabling policy framework for recycling processes are manifold. An increment of recycling rates is currently challenged by a lack of investment in the recycling

infrastructure, insufficient implementation of EPR and use of economic instruments such as landfill fees or pay-as-you-throw schemes, limited administrative capacity, and lack of standards and industry targets. Moreover, the pricing of recycled goods, such as reused goods, is another challenge as recycled goods compete with non-recycled goods. An enabling framework for recycling processes would entail social, economic and environmental benefits: an increment in recycling processes would first and foremost reduce the pressure on the natural environment and on landfills. Moreover, enhanced recycling would create jobs and economic opportunities, such as creating planned synergies between the informal waste workers responsible for collection and segregation, and the formal workers responsible for recycling. The aspect of energy which is saved in the process of recycling in comparison to other waste treatment or production processes is another essential benefit. Compost made from biodegradable waste improves the quality of the soil and serves as a natural fertiliser, which, in a country like India with more than 50 per cent of biodegradables in MSW composition, would be very beneficial.

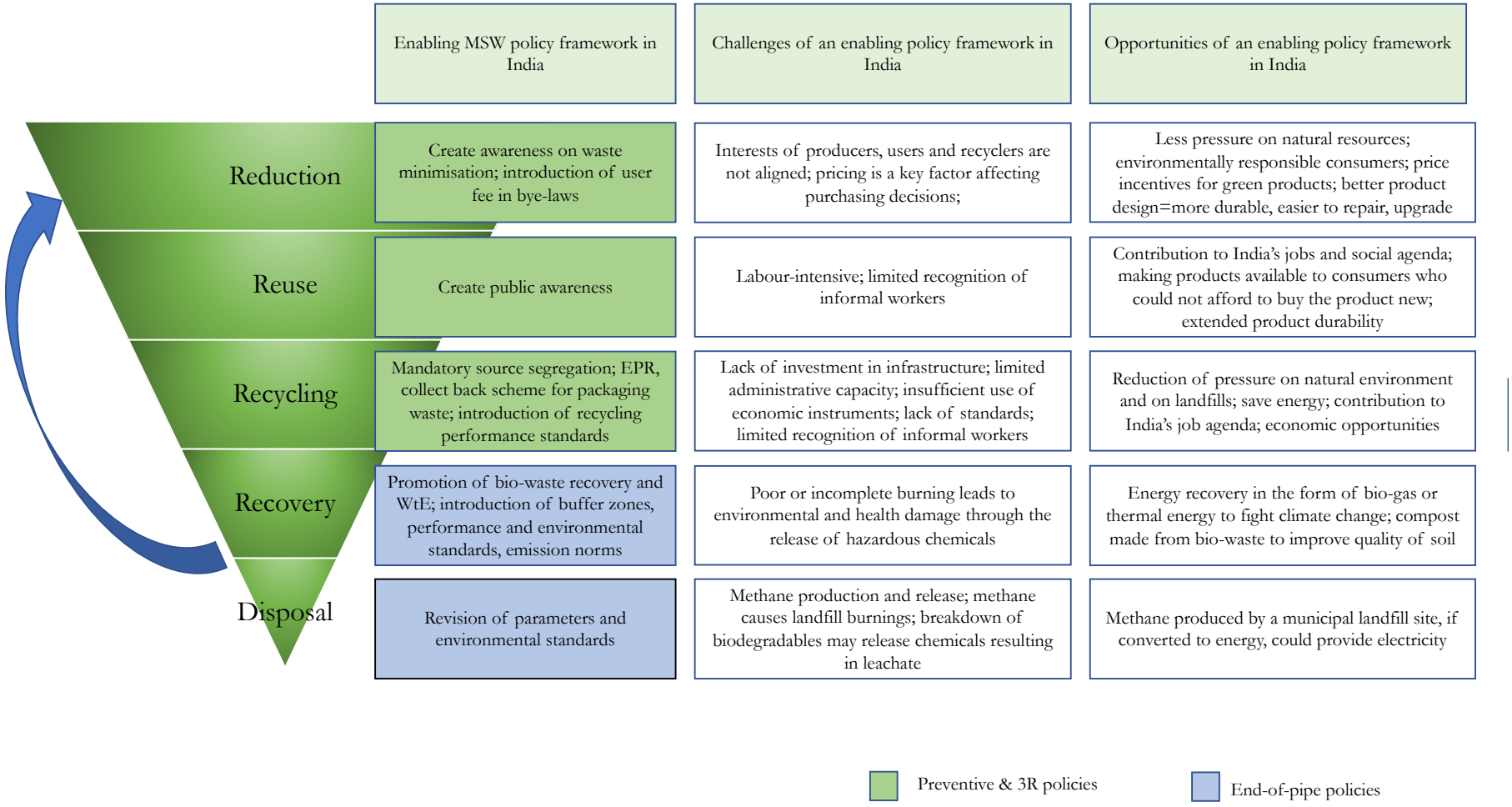
Recovery

While environmental standards and emission norms are key when it comes to MSW recovery technologies, it equally poses one of the biggest challenges in this field since poor or incomplete burning leads to environmental and health damage through the release of hazardous chemicals. At the same time, energy recovery from MSW, when done properly, involves enormous opportunities, as energy recovery in the form of biogas or thermal energy helps to fight climate change, because it can function as a renewable source of energy.

Disposal

The safe disposal of waste to landfills requires set landfill standards, and tight controls and monitoring of these standards. The challenges surrounding a safe disposal enabling policy framework in India are mainly in relation to the high amount of biodegradable waste which is still being dumped at the landfills, resulting in methane production and release. Methane in turn causes landfill burnings, which is harmful to the environment and public health. In addition to this, the breakdown of biodegradables may release chemicals resulting in leachate, which impacts groundwater. The reduction of biodegradables in the landfills and the use of methane gas to produce energy is key in order to decrease the harmful impact of a disposal site. Methane production, if converted to energy, could go towards dealing with urban India's shortage of power. Environmental authorities need to be responsible for issuing permits, conducting inspections and ensuring that standards are met.

Figure 5: Challenges and opportunities of integrating the waste hierarchy concept in India's MSW policy framework



Source: Author's own, based on the waste hierarchy concept.

4.4. Discussion and Summary

Creating an enabling policy framework for the implementation of the waste hierarchy concept in an MSW policy setting entails the integration of certain aspects at each of the five stages of the waste hierarchy. Aspects such as promotion of eco-design, certification of green products, introduction of quality standards, introduction of EPR mechanisms, setting of industry targets, implementation of source segregation and raising consumer awareness support an enabling policy framework for reduction, reuse and recycling. The introduction and monitoring of standards and introduction of landfill charges on the other hand are aspects that create an enabling framework for the recovery and disposal of material.

When analysing the MSW policy agenda, it becomes evident that it has been influenced by elements of the waste hierarchy concept throughout the years leading up to 2016. Some of the essential prerequisites, such as the introduction of source segregation and the promotion of recovery, have received more attention at a policy level than prerequisites such as decentralisation of MSWM structures, promotion of recycling processes, and the promotion of policy and economic instruments. The promotion of landfill diversion has been discussed since the mid-1990s as shortage of land was already a challenge at that time, and it was suggested that landfilling be restricted to non-biodegradable, inert waste, and other waste that is not suitable either for recycling or for biological processing. However, although the SWM Rules, 2016, introduce revised parameters, environmental instruments such as landfill taxes have not been introduced. The promotion of the integration of informal waste workers in the MSW economy is one of the crucial prerequisites for implementing the waste hierarchy concept, since waste workers are involved in the collection, segregation, and parts of the recycling processes of MSW. Different government documents show that the role of informal waste workers has been recognised and acknowledged since the mid-1990s, but the MSW Rules, 2000, do not acknowledge the existence of waste workers. This created a huge disconnect between the rules on paper and the reality on the ground. In the years after 2000, this disconnect has been addressed through multiple recommendations, as outlined in Table 10, and finally, the SWM Rules, 2016, recognise the informal workforce of the MSW system, although, as mentioned before, the implementation and enforcement of the rules is vague.

All five different stages of the waste hierarchy have therefore found different degrees of attention when looking at the current SWM Rules, 2016. While the rules mention the waste hierarchy concept as an overall umbrella in understanding sustainable MSWM, the two most favourable stages of reduction and reuse have only been addressed in a very limited manner,

as the rules only mention awareness creation and a potential user fee, but do not address eco-design or the certification of green or reused goods. The stage of recycling has been addressed by introducing mandatory source segregation, a collect-back scheme for packaging waste, and recycling performance standards. The stage of recovery receives greater attention as the rules promote bio-waste recovery and waste-to-energy, such as incineration, which is especially interesting when considering the Asim Burman report from 1999 in which it was already mentioned:

> The system of incineration is therefore not suitable under Indian conditions for this and the following additional reasons:
>
> 1. High ash and dust contents of Indian wastes.
> 2. The system is not environmentally friendly.
> 3. High capital cost, especially for adequate control of emissions.
> 4. High Operation and Maintenance cost.
> 5. The system requires high technical skill to man it.
>
> The incineration of general municipal waste is therefore not recommended as a method of Municipal Solid Waste disposal.[472]

As highlighted in Table 8, the Indian government has had altering opinions about waste-to-energy technologies or 'cradle-to-grave'[473] approaches, especially incineration, throughout the years. While the calls for alternative options and research prior to incineration have been persistent and present throughout the years, the SWM Rules, 2016 put an emphasis on the ULB's role in the promotion and facilitation of WtE processes.[474] Moreover, in 2018 India's Supreme Court proceedings on that matter consider "[w]aste to Energy (…) [being] the most eco friendly method of disposal of MSW"[475], underlining on the one hand the complexity of stakeholders who are involved in decision-making and on the other hand the thereof resulting very different takes on WtE technologies. More than that, these developments underline that, even though technologies such as incineration have been deemed rather inappropriate for the Indian waste composition, decision-makers still incorporated the promotion of these technologies into the regulatory framework.

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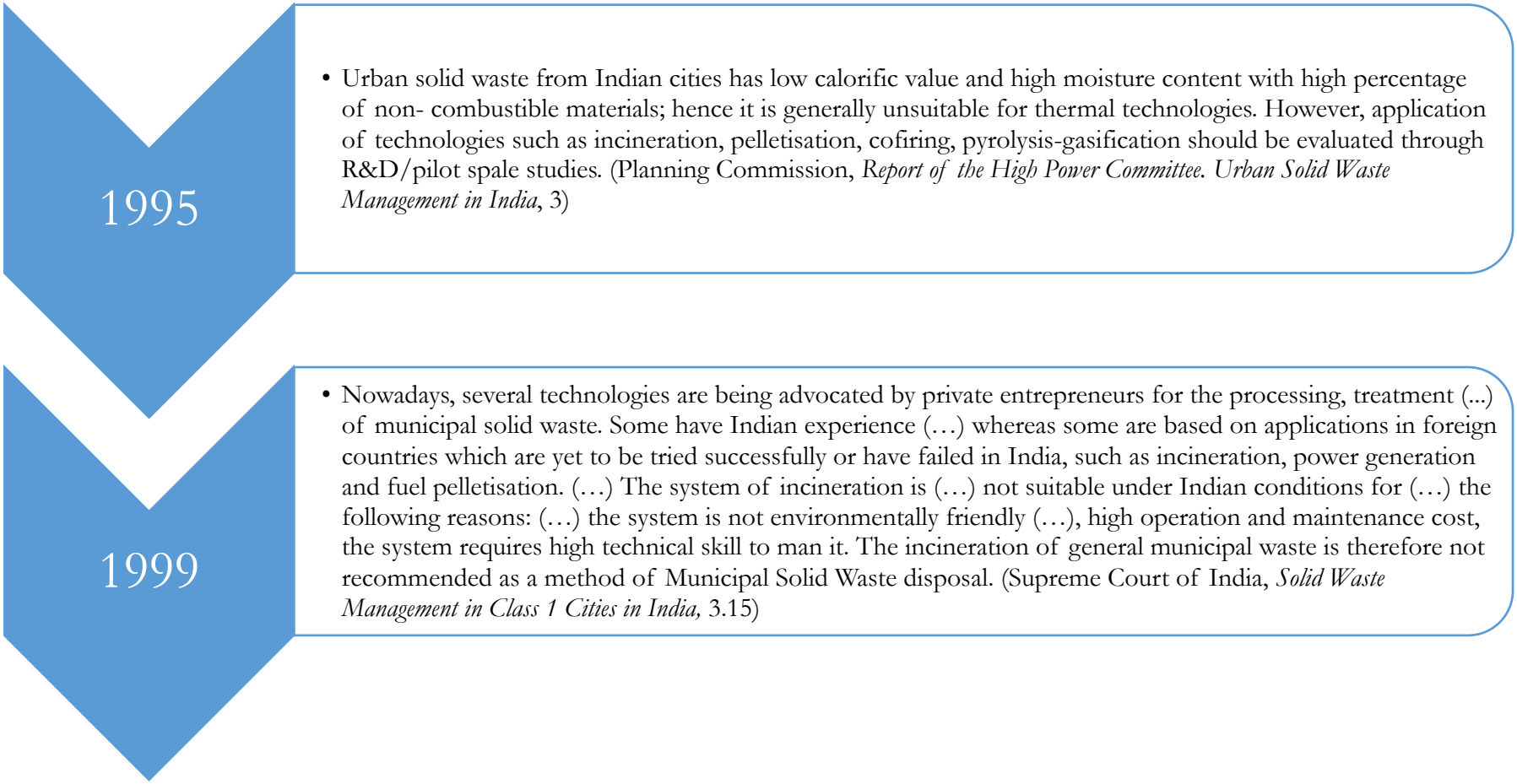
[472] Supreme Court of India, *Solid Waste Management in Class 1 Cities in India. Report of the Committee Constituted by the Hon. Supreme Court of India*, 3.15.3.

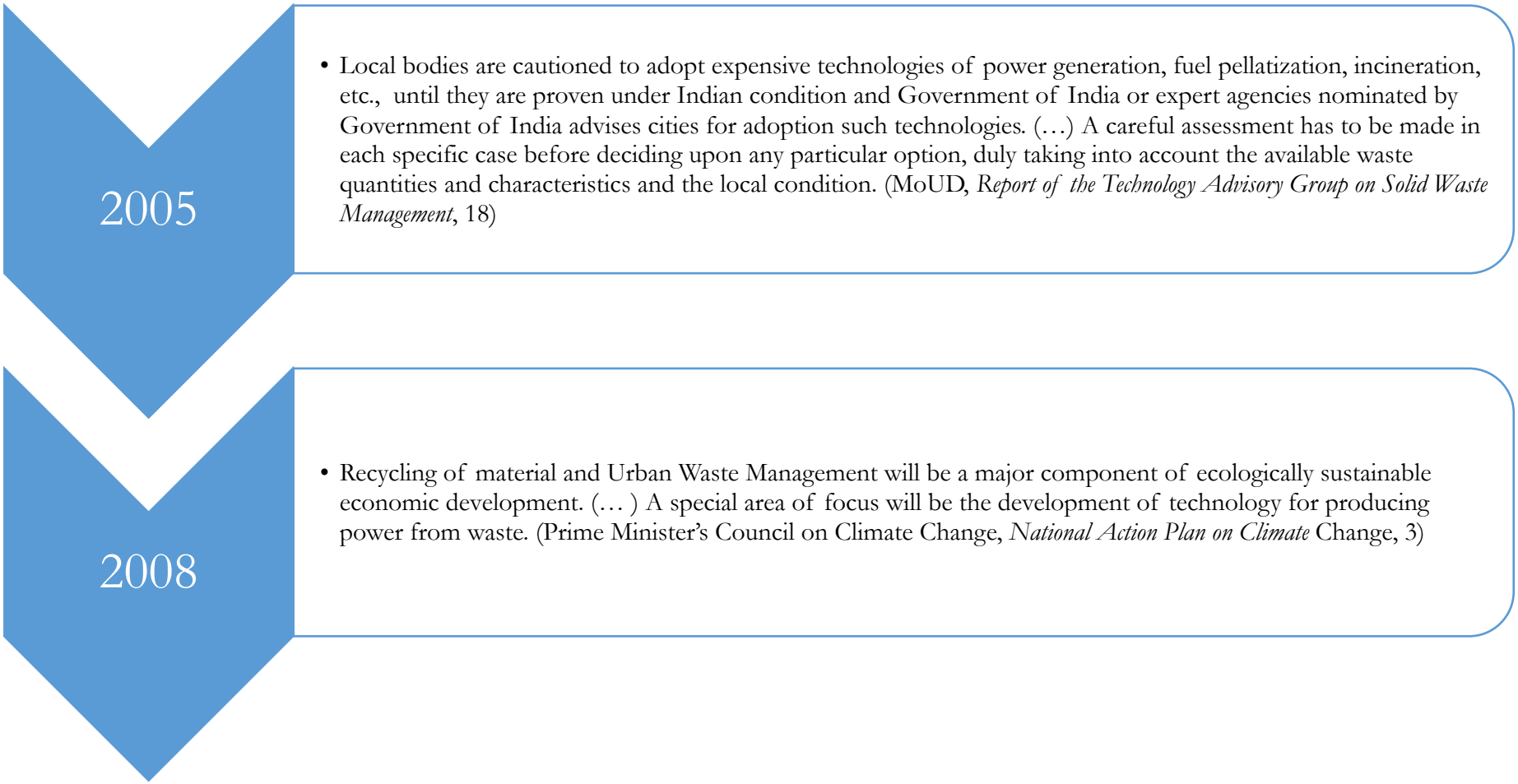
[473] The term 'cradle-to-grave' is the official terminology with which Ramky (operator of the Narela WtE plant), an Indian provider for waste management services, is advertising for their waste management services on their website. Ramky Enviro Engineers Ltd, "Waste to Energy", Ramky Enviro Engineers Ltd, http://ramkyenviroengineers.com/index.php/clean-energy (last accessed April 10, 2019). 'Cradle-to-grave' is a concept that describes on the one hand the development and start ('cradle') of a product, business and process and the end of it, which is the disposal stage ('grave'). The term stands in direct contrast to 'cradle-to-cradle' philosophy, an approach which aims at limiting a products' environmental impact and closing the loop.

[474] Ministry of Environment, "Solid Waste Management Rules, 2016", 15(v).

[475] Supreme Court of India, *Record of Proceedings. Writ Petition(S) (Civil) No(S). 202/1995* (Supreme Court of India, 2018).

Table 13: The government's stand on the 'cradle-to-grave' approach till 2016



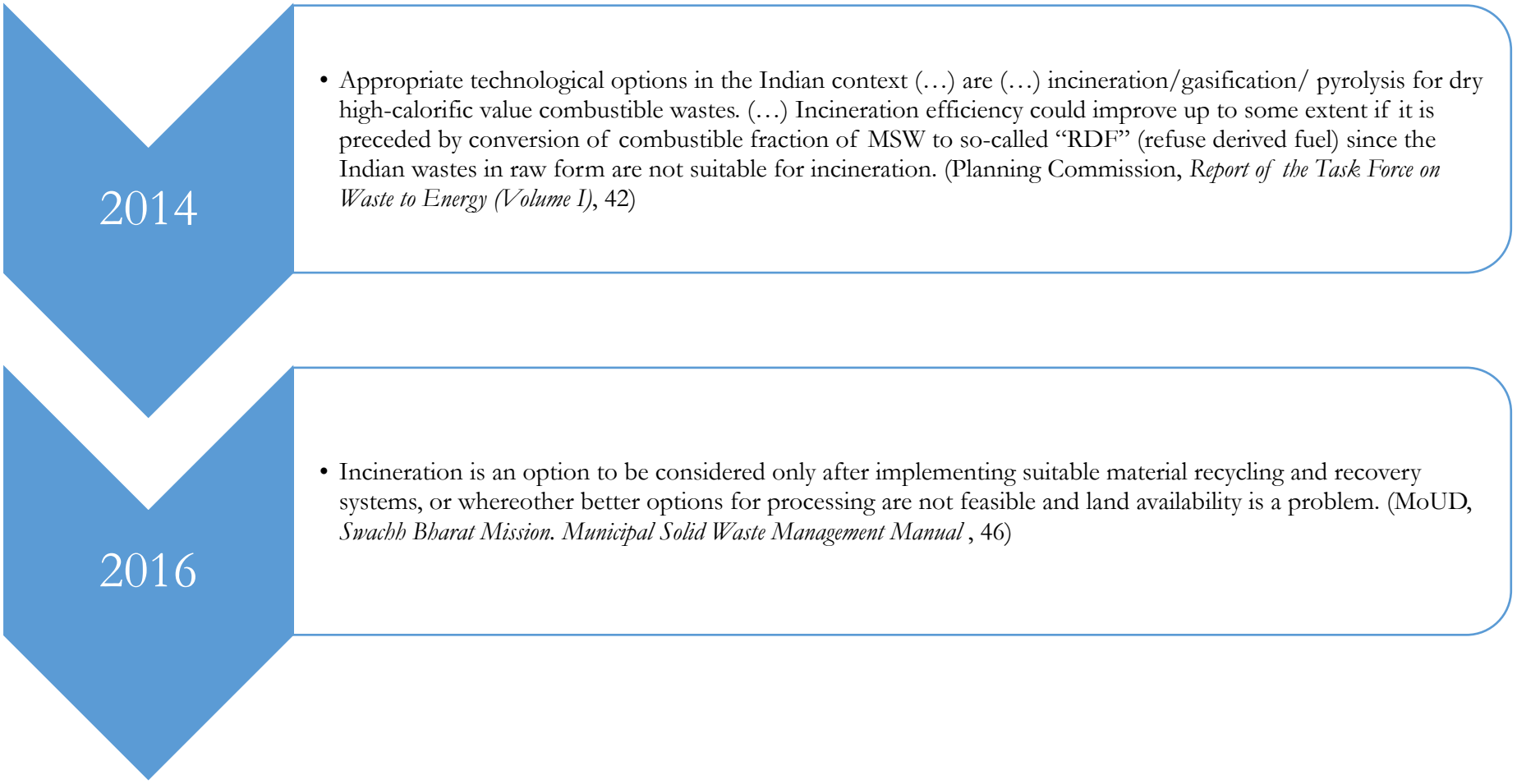

2005
• Local bodies are cautioned to adopt expensive technologies of power generation, fuel pellatization, incineration, etc., until they are proven under Indian condition and Government of India or expert agencies nominated by Government of India advises cities for adoption such technologies. (…) A careful assessment has to be made in each specific case before deciding upon any particular option, duly taking into account the available waste quantities and characteristics and the local condition. (MoUD, *Report of the Technology Advisory Group on Solid Waste Management*, 18)
2008
• Recycling of material and Urban Waste Management will be a major component of ecologically sustainable economic development. (…) A special area of focus will be the development of technology for producing power from waste. (Prime Minister's Council on Climate Change, *National Action Plan on Climate* Change, 3)

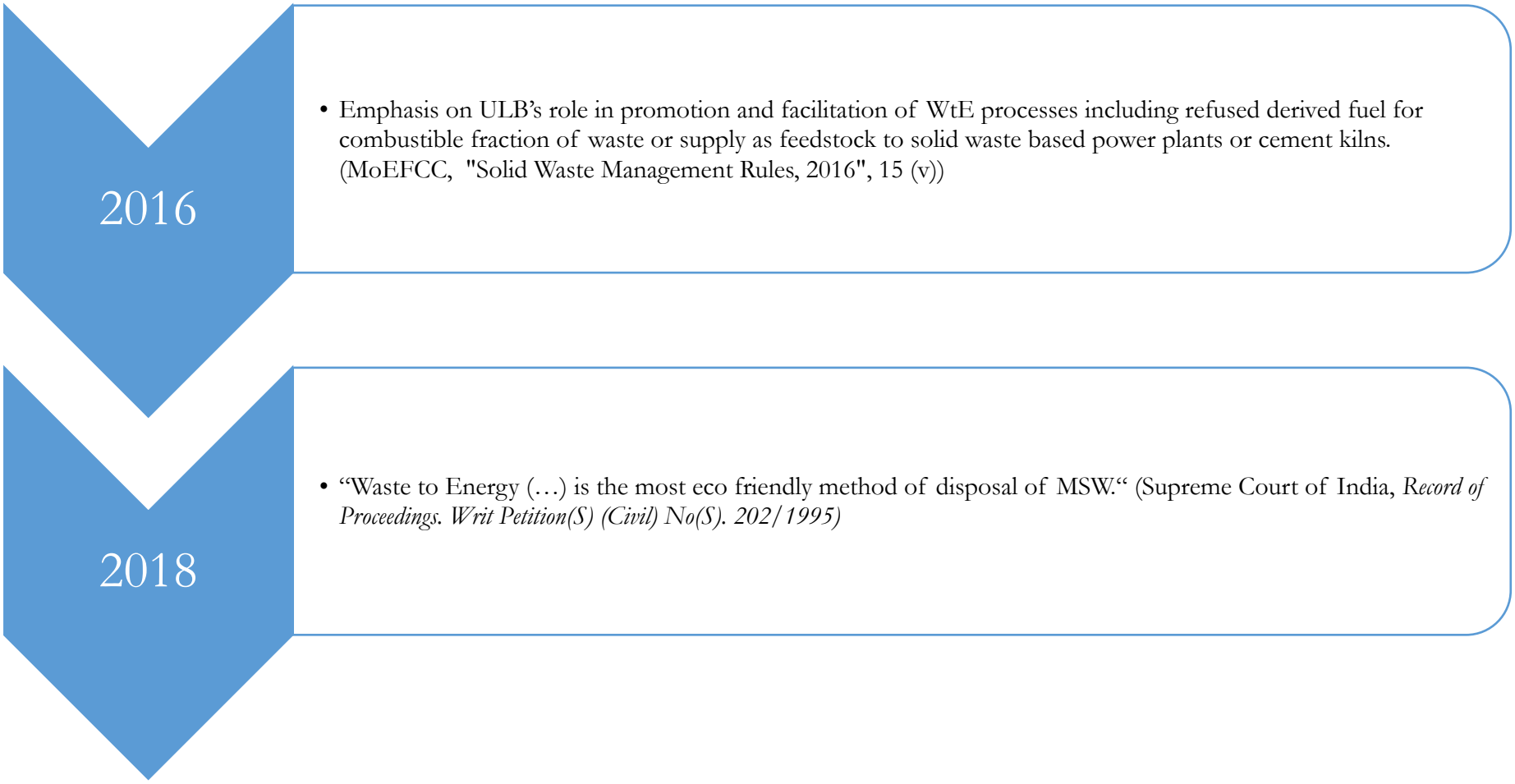
2010

- Strategies for recovering energy by incineration of packaging waste should be discouraged and banned. Design safer packaging, sorting, separating, reuse, recycling and safe reprocessing should be encouraged and promoted. (MoEF, *Report of the Committee to Evolve Road Map on Management of Wastes in India*, 30)

2013

- (…) while every effort should be made in the first place to minimize generation of waste materials and to recycle and reuse them to the extent feasible, the option of Energy Recovery from Wastes be also duly examined. (…) Improperly operated incineration plants cause air pollution. Burning garbage is not a clean process as it produces tonnes of toxic ash and pollutes the air and water. Cost of incinerator and additional investment on pollution control devices make the process capital - intensive. Under Indian conditions large scale incineration plants are economically non - viable in view of their capital - intensive character and the low calorific value of city garbage available. (MoUD, *Advisory on Improving Municipal Solid Waste Management Services*, 14)


2014
• Appropriate technological options in the Indian context (…) are (…) incineration/gasification/ pyrolysis for dry high-calorific value combustible wastes. (…) Incineration efficiency could improve up to some extent if it is preceded by conversion of combustible fraction of MSW to so-called "RDF" (refuse derived fuel) since the Indian wastes in raw form are not suitable for incineration. (Planning Commission, *Report of the Task Force on Waste to Energy (Volume I)*, 42)
2016
• Incineration is an option to be considered only after implementing suitable material recycling and recovery systems, or whereother better options for processing are not feasible and land availability is a problem. (MoUD, *Swachh Bharat Mission. Municipal Solid Waste Management Manual* , 46)



Source: Author's own.

Moreover, the rules include the introduction of buffer zones around recovery systems, and the introduction of performance and environmental standards and emission norms. The least favourable stage of disposal includes a set of revised landfill parameters and environmental standards, but the rules fail to address landfill charges or landfill taxes.

It becomes evident that the SWM Rules, 2016, cover elements of the waste hierarchy concept, but the aspects which facilitate an enabling policy framework become more elaborate the lower one goes in the waste hierarchy pyramid. Non-alignment of stakeholder interests, limitations in the implementation of the recognition of the informal waste workers, limitations in capacities and investments, lack of standards, enforcement and monitoring, as well as insufficient use of economic instruments create a challenging scenario. At the same time, this scenario reveals enormous opportunities: an enabling policy framework for the waste hierarchy logic to be implemented in a sound manner can reduce the pressure on natural resources, contribute to the job market and social agenda, and promote the fight against climate change.

5. Chasing Waste—Impacts of India's MSWM Agenda on Delhi's MSWM Economy

The landscape of rules and policies related to MSW in India has undergone major developments and shifts during the past three decades, and while the primary drivers for MSWM are considered to be public health, environment protection and the resource value of waste, the driver of the free market plays an equally important role when analysing the policy documents and developments. By substantially focussing on recovery and disposal as MSW treatment options, India has fed into a technology-based system, only partially considering the MSW context in terms of composition of waste and stakeholders involved. Over many years, the developments in the institutionalised frame have increased the competition for access to waste between the informal and formal economies on the ground, which has set the stage for a conflicted relationship between formal and informal private actors, public actors and the community. The potential social, environmental and economic gains for involved actors that would result from synergies and collaborations, also between the informal and formal waste economies, have been undermined or not taken into consideration by the national and local governments so far. These policy developments have impacted the MSWM economy over the past three decades. Delhi, being the capital, has been at the forefront of the policy shift, and the consequent string of events have been visible over the past decades.

The case of Delhi, being the capital, demonstrates very powerfully how the agenda setting on a political level in the last two decades impacts the dynamics on the implementation level. With one in every hundredth person in Delhi being in one way or the other engaged in the waste sector, the actor landscape of Delhi's solid waste management economy is as diverse as it is dynamic and is shaped by various public and private actors and their motives in driving waste-relevant policies. The complexity of the landscape is increased by the diverse actors' objectives and priorities, various technologies, and manifold and divergent management approaches. The case of Delhi is especially challenging as its actor landscape mirrors the developments of the recent years.

5.1. Delhi's Waste Site Story—Alliances, Interests and Impacts

> (…)[W]aste is somehow a paradox. In industrialized countries, the excessive generation of solid wastes is an immense burden for the society, and municipal authorities face tremendous difficulties disposing of these huge masses of piled up refuse. Yet, in less developed societies, though creating problems of final disposal, waste is a bountiful treasure for millions of people. (…) Wastes, there, signify a major means of survival for a great number of underprivileged human beings and secure the livelihoods of a substantial part of the urban population.[476]

While this statement, which was made in relation to India almost fifteen years ago, is in its essence still true and relatable to different contexts across the world, the clear distinction between waste as a burden in industrialised countries and waste as of value in less developed societies has dissolved or is at least blurred, especially in Delhi's MSW context. While Delhi's municipalities continue to face extreme challenges in the context of MSWM in the city, MSW is meanwhile an immense burden not only for the ULBs, but also for the society. At the same time, MSW has remained an opportunity for the urban poor throughout the years, while it also began to be recognised as a business opportunity for the private formal actors in Delhi.

As in many other Indian cities, municipal solid waste management in Delhi is based on two different systems that function side by side and partly overlap. On the one hand, there is the formal system, and on the other, the informal system. Urban local bodies, citizen groups, civil society and the private sector (formal and informal) are involved in driving a variety of approaches to finding sustainable working solutions for Delhi's MSWM challenge.

5.1.1. Delhi's Public Sector Characteristics

In India, MSWM is part of public health and sanitation, and, according to the constitution, it falls under the State list. The 74th Constitutional Amendment (1992) transferred the

[476] Köberlein, *Living from Waste: Livelihoods of the Actors Involved in Delhi's Informal Waste Recycling Economy*, 2.

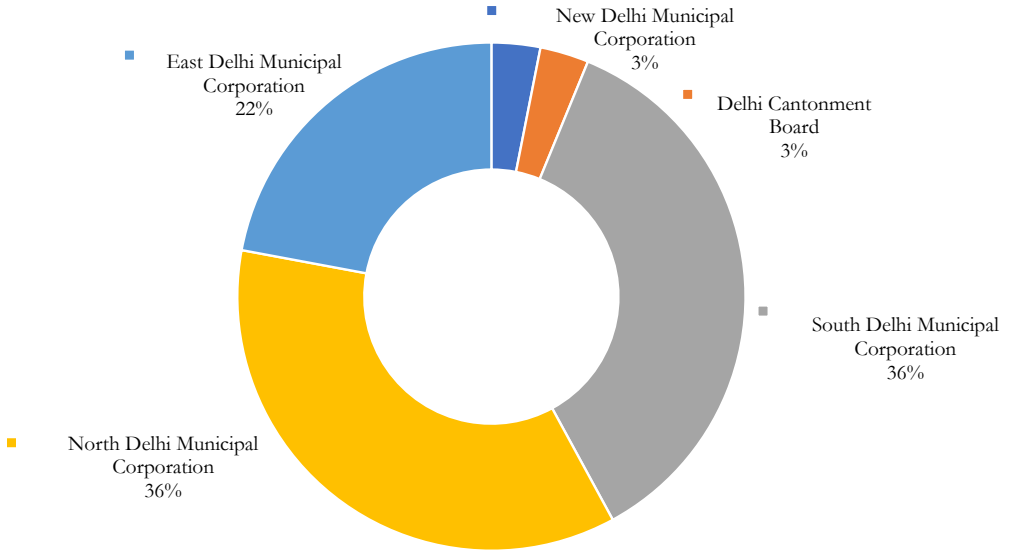
responsibility for collection, treatment and disposal of MSW from state governments to the ULBs. Therefore, solid waste management is an obligatory function of ULBs, and every municipal authority is responsible for the implementation of the provisions and development of infrastructure for collection, storage, segregation, transportation, processing and disposal of municipal solid wastes. The State Pollution Control Boards (SPCB) have to monitor compliance of the standards regarding ground water, ambient air, leachate quality and compost quality, including incineration standards. The ever-increasing amount of waste in Delhi has an intense impact on the lives of citizens, whose growing awareness increases the burden on the local government. Delhi's place at the intersection of local, state and national jurisdictions adds to the challenge of MSW governance facing the city.

Until 2012, the National Capital Territory (NCT) Delhi was administratively divided into three statutory towns governed by three different municipalities: The Municipal Corporation of Delhi (MCD), the New Delhi Municipal Committee (NDMC) and the Delhi Cantonment Board (DCB), which were responsible for the statutory duties to scavenge and clean the city of Delhi. Among these three local bodies, the MCD was the agency which had the largest responsibility by way of providing almost 95 per cent of the whole NCT area with basic amenities. In 2012, the MCD was split into three smaller municipal corporations. The North Delhi Municipal Corporation and South Delhi Municipal Corporation (SDMC), each containing 104 municipal wards, and the East Delhi Municipal Corporation (EDMC) containing sixty-four wards.[477]

As outlined in Figure 6, since 2012, Delhi's local government is made up of five urban local bodies, namely, the New Delhi Municipal Council (NDMC), the Delhi Cantonment Board (DCB), the North Delhi Municipal Corporation, the South Delhi Municipal Corporation (SDMC) and the East Delhi Municipal Corporation, which are responsible for more than 9,500 MSW TPD, which is being generated by the city. The then Delhi chief minister Sheila Dikshit welcomed this step, arguing that the MCD as a "(…) civic body (…) had become unmanageable because of its control over 97 per cent of the city. The MCD was inefficient and corrupt as was proved by the accumulation of garbage across the city (…)."[478]

[477] Centre for Policy Research, *The Intersection of Governments in Delhi* (New Delhi: Centre for Policy Research, 2015).
[478] "'MCD Trifurcation Will Benefit Delhi'".

Figure 6: Delhi's urban local bodies and their jurisdictional responsibility of Delhi's area in percentage in 2015



Source: Based on data from CPR (2015), 1–2.

The MCD constituted under the Delhi Municipal Corporation Act, 1957, the NDMC constituted under the New Delhi Municipal Council Act, 1994, and the DCB governed by the Cantonments Act, 2006, describe the functions of the municipalities in regard to MSWM differently. The New Delhi Municipal Council Act, 1994, as well as the Delhi Municipal Corporation Act, 1957, describe the obligatory functions of the council as "(…) the scavenging, removal and disposal of filth, rubbish and other obnoxious or polluted matters (…)."[479] In Section 351, The Delhi Municipal Corporation Act specifies that "[a]ll matters deposited in public receptacles, depots and places provided (…) and all matters collected by municipal employees or contractors (…) shall be the property of the Corporation."[480] The DCB was established in 1914 and is legislated by the Cantonments Act, 1924, which was amended in 2006. It describes in Article 141 special provisions for collection and solid waste management of the Cantonments Act, 2006:

> (1) All solid waste material generated in a cantonment shall be removed by the Board and be brought to the compost sites or sanitary land sites or trenching sites earmarked by it for the purpose.

[479] The New Delhi Municipal Council, "The New Delhi Municipal Council Act, 1994", (New Delhi: The New Delhi Municipal Council 1994), Chapter III, 11.(c); Municipal Corporation of Delhi (MCD), "The Delhi Municipal Corporation Act, 1957", (Delhi: Municipal Corporation of Delhi (MCD), 1957), 42 (c).
[480] Municipal Corporation of Delhi (MCD), "The Delhi Municipal Corporation Act, 1957".

(2) The Board shall also devise schemes for collecting rubbish and garbage from each house in the cantonment and may, if considers necessary, associate residents' welfare associations or such other non governmental organisation for this purpose.

(3) As far as possible the Board shall devise appropriate system to ensure that all compostable or biodegradable waste in the cantonment is recycled and used for generating manure, biogas or any other form of energy.[481]

Therefore, the functions of the municipalities[482] include managing the most urgent needs, such as removing the waste from the city to keep the city clean. A major focus is on developing basic cleaning services such as street sweeping, waste collection, gutter maintenance and running landfills. The umbrella MCD is the agency responsible for around 94 per cent of the overall NCT area. It provides bins for the households in the neighbourhoods and is in charge of collecting the refuse from these bins. However, according to Chintan, a Delhi-based environmental research and action group working to support informal waste workers, its main work focuses on the transport of the waste in order to dispose it in sanitary landfill sites.[483] The municipalities rarely offer universal service coverage and sanitary waste disposal, as priority is given to collection and disposal.[484] Sustainable waste recovery and recycling is given rather low priority, which in part is dealt with by the informal waste workers. The formulation and provisions of the municipal laws have implications for informal waste workers: with the Delhi Municipal Corporation Act, 1957, delineating that the waste becomes the municipality's property once either picked up by a municipal employee or contractor or disposed in a designated place, the waste workers in Delhi work in a grey zone. While municipal laws function as boundaries within which the formal realm is clearly distinguishable from the informal realm, the formulation of the Delhi Municipal Corporation Act, 1957, gives way for an unauthorised waste space—i.e. when waste is being collected from a waste generator source by an informal waste worker, or waste is being disposed in an unauthorised space where the Act does not apply.[485]

Delhi's municipalities employ around 60,000[486] *safai karamchari*s (persons engaged in or employed for any sanitation work) or *swachta karamchari*s (persons engaged in or employed

[481] Ministry of Defence, "The Cantonments Act, 2006", (New Delhi: Government of India, 2006), 54.
[482] Dukhan, Bourbon-Séclet, and Yannic, "Linking Public and Private Action for Sustainable Waste Management", 9.
[483] Chintan, *Space for Waste Planning for the Informal Recycling Sector*, 2.
[484] Le Courtois, "Municipal Solid Waste: Turning a Problem into Resource", 3.
[485] Ananya Roy, "Urban Informality: Toward an Epistemology of Planning", *Journal of the american planning association* 71, no. 2 (2005).
[486] Centre for Science and Environment, *Recommendations for Long Term Action Plan for Solid Waste Management in Delhi*, 13.

for any sanitation work) in the NCT, and all of them belong to the *balmiki* community,[487] who are engaged in street sweeping, waste transportation and disposal of MSW. The task of the municipal sweepers in Delhi, who organise themselves in multiple unions, is to clean the streets in a particular area, to collect the waste and dispose it in the municipal bin of that area. The terminology for this task has been the subject of debate time and again. In 2016, for instance, the EDMC "[i]n a move to disassociate the taboo associates with the sanitation work (…) [decided] to re-designate the sanitation workers from safai karamcharis to parayavaran sahayak (Environment assistant)." [488] While some unions, like the Swatantra Mazdoor Vikas Sanyukt Morcha, welcomed this decision as it will "(…) benefit the workers psychologically"[489], other union representatives, such as the one from the United Front of MCD Employees, wondered "[h]ow is a name change going to help the workers?"[490] Once the EDMC had implemented this decision, the North and South Delhi Corporation showed interest in changing the terminology for t MCD waste workers. While this decision by the EDMC is indeed a positive sign, which shows some sort of empathy with the formal waste force, it also underlines the helplessness of the officials when trying to deal with the societal taboo around this work. At the other end of this spectrum, having seemingly already reached what the EDMC is aiming at, are the remarks by a public sector representative when discussing *Swachh Survekshan*, the annual survey conducted under the Swachh Bharat Mission programme: "There are no rag pickers or sweepers anymore. There are only *swachh* workers. From rag pickers to *swachh* workers. People are proud to work with waste. They say it with pride: 'I am a *swachh* worker'."[491] While the question of terminology is mostly the subject of debate among those who do not work with waste, the much more relevant questions for formal waste workers in Delhi are related to their employment situation in terms of health

[487] The Balmiki Community consists of different castes, like the Bhangi, Mehtar, Chura, Lal Beghi and Halalkhor. They live in the northern and central regions of India and are traditionally associated with cleaning and working with refuse, as a result of which they face social stigma.
[488] Paras Singh, "Plenty in a Name for Safai Workers", *The Times of India*, August 23, 2016, https://timesofindia.indiatimes.com/city/delhi/Plenty-in-a-name-for-safai-workers/articleshow/53820065.cms (last accessed April 11, 2019).
[489] Mohit Sharma, "Delhi's Sanitation Workers Are Now Paryavaran", *Hindustan Times*, August 22, 2016, https://www.hindustantimes.com/delhi-news/delhi-s-sanitation-workers-are-now-paryavaran-sahayaks/story-CuDmFubIavZIh4W8Bij5QK.html (last accessed April 10, 2019).
[490] Ibid.
[491] Public sector representative, New Delhi, September 30, 2016.

insurance, salaries or working conditions. Especially the salaries of *safai karamcharis*[492] and the regular mode of payment has been a recurring issue and the source of multiple strikes[493] among Delhi's sweepers. In 2015, for example, around 12,000 EDMC sanitation workers went on strike since their salaries were not paid in a timely manner. While the municipal workers had to wait to get paid, the *Bharatiya Janata Party* (BJP)-led East and North corporations held the *Aam Aadmi Party* (AAP)-led Delhi government accountable for unreleased funds, and the AAP-led government further held the central government accountable for unreleased funds.[494] With the EDMC workers on strike, employees of the SDMC too went on strike, as in 2016.[495] This situation escalated in a petition by the *Association of Safai Karamcharis versus the EDMC*, which had been filed in the High Court of Delhi, in which the "(…) relief of timely payment of (…) salaries"[496] was sought. With a monthly salary of approximately rupees 9,000,[497] it is often the case that their official duty is not the only source of livelihood for municipal sweepers. In order to supplement their income, many municipal sweepers have contracts with waste generators in the area in which they work and collect their waste to pick out the recyclable material. "Due to these tasks municipal sweepers have the first right to pick discarded recyclable materials and therefore retrieve saleable materials

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492 Abhishek Angad, "Delhi MCD Bypolls: Salary Delay Upsets Safai Karamcharis", *The Indian Express*, May 16, 2016, https://indianexpress.com/article/cities/delhi/delhi-mcd-bypolls-salary-delay-upsets-safai-karamcharis-2802664/ (last accessed April 9, 2019); "Some Safai Karamcharis Absent Despite Getting Salary: Sdmc", *The Pioineer*, January 31, 2016, https://www.dailypioneer.com/2016/sunday-edition/some-safai-karamcharis-absent-despite-getting-salary-sdmc.html (last accessed April 9, 2019); "South Delhi Municipal Corporation to Regularise Daily Wage Safai Karamcharis", *The Indian Express*, October 17, 2016, https://indianexpress.com/article/cities/delhi/south-delhi-municipal-corporation-to-regularise-daily-wage-safai-karamcharis-3086750/ (last accessed April 9, 2019); Paras Singh, "Salary Hike Rollback Raises a Stink", *The Times of India*, September 4, 2018, https://timesofindia.indiatimes.com/city/delhi/salary-hike-rollback-raises-a-stink/articleshow/65662870.cms (last accessed April 11, 2019); "MCD to Pay Arrears to Safai Karamcharis", *The Hindu*, October 9, 2011, https://www.thehindu.com/news/cities/Delhi/mcd-to-pay-arrears-to-safai-karamcharis/article2523055.ece (last accessed April 9, 2019).

493 Ishan Kukreti, "Raising a Stink: MCD Workers Survive on Salaries of Rs 9000", *Newslaundry.com*, January 11, 2017, https://www.newslaundry.com/2017/01/11/raising-a-stink-mcd-workers-survive-on-salaries-of-rs-9000 (last accessed April 10, 2019); Sonal Mehrotra, "Delhi Government Releases Salaries of Sanitation Workers, Arvind Kejriwal Blames Centre for Delay", *NDTV.com*, June 9, 2015, https://www.ndtv.com/india-news/delhi-government-releases-salaries-of-mcd-workers-arvind-kejriwal-blames-centre-for-delay-769937 (last accessed April 10, 2019); Ankita Sharma, "Safai Karamcharis' Strike Turns City Strets into Garbage Dump", *The Pioneer*, June 5, 2015, https://www.dailypioneer.com/2015/sunday-edition/safai-karamcharis-strike-turns-city-streets-into-garbage-dump.html (last accessed April 10, 2019); "Most Staff End Strike in Delhi, but Safai Karamcharis Go On ", *The Times of India*, February 7, 2016, https://timesofindia.indiatimes.com/city/delhi/Most-staff-end-strike-in-Delhi-but-safai-karamcharis-go-on/articleshow/50884633.cms (last accessed April 9, 2019); "Don't Say 'No Funds', Pay the Salaries: Delhi Hc to MCD, AAP Govt", *Hindustan Times*, May 2, 2016, https://www.hindustantimes.com/delhi-news/don-t-say-no-funds-pay-the-salaries-delhi-hc-to-mcd-aap-govt/story-AbTcYOBuVZURM1BNhyqV5J.html (last accessed April 9, 2019).

494 Angad, "Delhi MCD Bypolls: Salary Delay Upsets Safai Karamcharis"; Mehrotra, "Delhi Government Releases Salaries of Sanitation Workers, Arvind Kejriwal Blames Centre for Delay".

495 "Some Safai Karamcharis Absent Despite Getting Salary: SDMC".

496 Delhi High Court, "W.P. (C) 711/2016, W.P. (C). 1001/2016, W.P. (C) 1176/2016", (New Delhi: Delhi High Court, 2016).

497 Kukreti, "Raising a Stink: MCD Workers Survive on Salaries of Rs 9000".

such as old bottles, cardboard or metal items from the waste disposal stream and sell them off to any of the waste traders."[498] In this way, the collection of waste from households and the activity in the recycle sector are an additional income activity for municipal sweepers. The research at hand revealed that some municipal sweepers also have tie-ups with informal waste workers in the areas they work in, in order to supplement their income.[499]

The limitations of the public sector in terms of finances, skills and knowledge in order to implement a sustainable and functioning MSWM system in a way which fits the context and situation in Delhi is a recurring topic of public debate.[500] When requested to comment on the MSW situation in Delhi, municipalities tend to talk of insufficient or non-existent funds.[501] One of the most obvious elements of Delhi's non-sustainable and improper functioning MSWM system are the three landfill sites—Ghazipur (1984, EDMC), Bhalswa (1984, North Delhi Municipal Corporation) and Okhla (1996, SDMC). All three are not engineered sanitary landfills and are not designed as per the MSW Rules, 2000, and all three are saturated for over a decade and yet are still active.[502] The unscientific manner of disposal leads to a variety of issues related to ground water pollution, air pollution and pollution of the environment, and public health adjacent to the landfill sites.

While the debate about the decentralisation of elements of the MSW chain centres around the values of decentralisation and required infrastructure, interviews with involved stakeholders reveal the challenges the municipalities are experiencing when decentralising aspects of the MSWM chain. Municipalities struggle with the organisation of different stakeholders in a decentralised setting:

> Over the past years we've experienced through our work that the municipalities do not want to deal with too many stakeholders. Usually they prefer having one main contact, therefore there is a big interest in the WtE plants. A decentralised MSW practice would effectively require the organisation of a variety of stakeholders. There is not big interest in this.[503]

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498 Köberlein, *Living from Waste: Livelihoods of the Actors Involved in Delhi's Informal Waste Recycling Economy*, 98.
499 See Box 12.
500 Singh Sambyal, "Delhi's Solid Waste: As Systemic Failure"; Sharma, "Safai Karamcharis' Strike Turns City Strets into Garbage Dump"; Rajeev Kumar, "Garbage Politics Stinks Delhi: Who Should Be Blamed - Kejriwal, BJP or You?", *Financial Express*, January 10, 2017, https://www.financialexpress.com/india-news/garbage-politics-stinks-delhi-who-should-be-blamed-kejriwal-bjp-or-you/502738/ (last accessed April 10, 2019); "Will Ensure Garbage Mountains-Free Delhi, Says Chief Minister", *The Statesman*, September 2, 2017, https://www.thestatesman.com/cities/will-ensure-garbage-mountains-free-delhi-says-chief-minister-1502486519.html (last accessed April 9, 2019); Somvanshi, "The Economy and Politics of Solid Waste in Delhi. A Rotten Deal for Ragpickers".
501 NGO representative, New Delhi, February 11, and May 20, 2017.
502 Delhi Development Authority (DDA), *Master Plan for Delhi - 2021*, 247.
503 NGO representative, New Delhi, May 20, 2017.

Often, Delhi municipalities prefer to have one contact point as it is easier to manage. This, in combination with the often-revealed attitude of the representatives of municipalities of "How much money are we going to invest and how much money do we make" [504], leads to increasing formal private sector participation and therefore increasing privatisation of certain aspects of the waste management system, such as the incineration of waste. WtE plants are often considered to be a one-stop shop, as municipalities are seemingly able to make MSW disappear from the public eye and have a single contact point to address and manage this, not considering the role of informal waste workers in the MSWM economy. The strong focus on the private formal sector became evident as early as 2010, when the Master Plan for Delhi 2021 was published by the Delhi Development Authority. The master plan displays quite clearly what the city's government is aiming at; the vision is to establish Delhi by 2021 as a "(…) a global metropolis and a world-class city, where all the people would be engaged in productive work with a better quality of life, living in a sustainable environment"[505], with a major focus on infrastructural development of the city. When developing a strategy for solid waste management, the Master Plan for Delhi 2021 includes only a vague outlook for the role of the *kabaris* in the city and their functioning in the recycling chain.[506] The existing limitations of the public sector in terms of finances, skills and knowledge gave way in the first place for the shift to privatisation, not considering the informal workers who form the very base of Delhi's MSWM system. This ignorance is time and again also reflected in statements in the public realm. For example, when a public sector representative in Delhi was asked in a conference to address the degrading situation of informal waste workers in the light of the ongoing privatisation process, the representative stated that "[t]here is no issue with the informal sector."[507] This kind of ignorance adds to the already strained situation of Delhi's informal waste workers.

5.1.2. Private Sector Characteristics

When analysing Delhi's private sector characteristics, it is essential to gain a distinctive understanding of private sector participation and the actors involved. Instead of understanding the private sector as a uniform group, it is crucial to recognise the informal waste workers as private actors who are part of Delhi's private sector group.

[504] NGO representative, New Delhi, May 20, 2017.
[505] Delhi Development Authority (DDA), *Master Plan for Delhi - 2021*, 2.
[506] Ibid., 246.
[507] Public sector representative, New Delhi, September 30, 2016.

Delhi's Informal MSW Economy

Historically, informal waste workers played a key role in India's waste management and recycling by reducing the burden of formal agencies and at the same time providing income opportunities for the urban poor in the informal waste economy. By 2016, it is estimated that India is home to around 1.5 million informal waste workers,[508] which is around 1 per cent of the Indian population working with waste. The involvement of informal waste workers in municipal solid waste management is driven by economic necessity, since informal activities in the waste sector, such as collection and recycling, secure the livelihood of the urban poor without substantive upfront investments.[509]

Before going into the details of the characteristics of Delhi's informal MSW economy, it is essential to capture the shift in understanding of informality that has occurred over the past forty years. As outlined in detail in Box 10, the understanding of informality has broadened since it was first defined by Keith Hart and the International Labour Organization (ILO). While in the beginning of the debate, the focus was on the characteristics of informal activities, in terms of activities as such and prerequisites and structure, the focus then shifted to the status of labour and the consequences for informal workers in terms of attention to the lack of social security and unprotected working conditions.

> The understanding of informality has evolved since Keith Hart (1973) first coined the term "informal sector" in 1971. At the 90th Session of the International Labour Conference in 2002, the Committee on the Informal Economy shifted the focus from "informal sector" to "informal economy", which it defined as "... all economic activities by workers and economic units that are—in law or in practice—not covered or insufficiently covered by formal arrangements. These activities are not included in the law, which means that they are operating outside the formal reach of the law; or they are not covered in practice, which means that—although they are operating within the formal reach of the law, the law is not applied or enforced; or the law discourages compliance because it is inappropriate, burdensome, or imposes excessive costs" (International Labour Organization 2002: 53).[510]

It is estimated that in 2000, nearly 93 per cent of India's total workforce was informal, and by 2016, this number had reduced to about 80 per cent. Nevertheless, the topic of informality has great relevance in the Indian context.[511] Delhi's case is particularly interesting, since the

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508 Chintan, "Scavengers to Managers"; Bose and Bhattacharya, "Why Ragpickers, Unrecognised and Unpaid, Are Critical for Waste Management in India".
509 UN-Habitat, *Solid Waste Management in the World's Cities*, 19.
510 Melanie Samson, *Forging a New Conceptualization of "the Public" in Waste Management* (Women in Informal Employment: Globalizing and Organizing (WIEGO), 2015) 3.
511 International Labour Organization (ILO), *Women and Men in the Informal Economy. A Statistical Picture* (International Labour Organization (ILO), 2002), 34; International Labour Organization (ILO), *Women and Men in the Informal Economy. A Statistical Picture (Second Edition)* (International Labour Organization (ILO), 2013), xi; ILO, *Women and Men in the Informal Economy. A Statistical Picture (Third Edition)* (International Labour Organization, 2018), 88.

existing municipal laws establish a special setting: while legal acts shall delineate rights and duties, also by defining boundaries, the Delhi Municipal Corporation Act, 1957, as mentioned before, establishes a grey zone for informal workers, as MSW is only considered municipal property when it is either collected by a municipal employee or contractor, or if it is deposited in an authorised area.

Box 10: Informality

Informal sector activities have been the focus of scholarly debate for more than forty years. In the early 1970s, the concept of informal sector was identified by the British anthropologist Keith Hart and the International Labour Organization. The ILO defined their distinctions, stating that the informal sector refers primarily to the activities of "petty-traders, street hawkers, shoeshine boys and other groups 'underemployed' on the streets of the big towns, and includes a range of wage earners and self-employed persons, male as well as female."[512] The report further argued that these activities were "characterized [sic] by: a) ease of entry; b) reliance on indigenous resources; c) family ownership of enterprises; d) small-scale operation; e) labor-intensive [sic] and adapted technology; f) skills acquired outside the formal school system; and g) unregulated and competitive markets."[513]

In recent years, the terms 'informal sector' and 'informal economy' have been subject to research and debates in international development circles. Although some scholars still refer to the definition of informality that was set up forty years ago, there has been a change in defining this system of informality. Today, as the current era of liberalisation and globalisation has given rise to new forms of informality, there is renewed interest in the informal economy worldwide. This has contributed to a further segmentation of its structure. Hence, the two-sector approach from forty years ago can't be applied anymore. Those who oppose the ILO's dualistic approach and the view that the informal sector was a small scale, easy-entry way of doing things, developed a deeper understanding of the concept while paying more attention to the status of labour (undeclared and unwritten contracts; lacking benefits like social security, pensions, dismissal protection etc.), the condition of work (unprotected and hazardous),, as well as the form of management of some firms (fiscal frauds, unrecorded payment etc.).

Although the different schools and their concepts vary widely concerning the drivers of informality and its effects (particularly its role in economic growth), they all agree that

[512] International Labour Organization (ILO), *Employment, Incomes and Equality: A Strategy for Increasing Productive Employment in Kenya; Report of an Inter-Agency Team Financed by the United Nations Development Programme* (Interantional Labour Organization (ILO), 1973), 5.
[513] Ibid., 6.

rural–urban migration acts as a catalyst for informality.[514] Scholars today also refrain from using the term informal sector and prefer to use the terms 'informal economy' or 'informal employment'. This is because informality does not form a specific sector as such but can rather be found throughout the economy. According to the ILO, which shifted its focus on informality in 2002, the informal economy refers to "all economic activities that are, in law or practice, not covered or insufficiently covered by formal arrangements."[515] Informal employment is a broader concept that is comprised of different categories of employment, patterns of segmentation, and degrees of workers' control over their work.

Source: Author's own, based on Paterok (2011), 34–35.

Approximately 150,000 to 200,000 informal waste workers provide essential work to the city of Delhi as they form the very base of waste collection, segregation and dismantling, although these services are being provided mostly at no cost to the government, the authorities or the residents.[516] Every hundredth person in Delhi is therefore a "silent environmentalists", as the NGO Chintan calls waste workers, who work independently, employing either family members or hired, non-family workers or apprentices.[517] Informal activities in the MSW economy require little or no capital, which makes work with waste a low entry-cost opportunity for the urban poor to earn a living. At the same time, working with waste is a highly unstable form of employment which provides only a low income while operating under unsafe working conditions. Delhi's informal MSW workforce, consisting of people belonging to vulnerable groups such as recent migrants, unemployed, disabled, children, women or elderly, has a long history of exploitation and oppression. With no proper permits or legal status, waste workers often face occupational hazards and police harassment, while at the same time having to fight for access to waste. Moreover, being socially stigmatised, as outlined in Box 4, Box 8 and Box 11, leaves informal workers at risk of being dependent on powerful collaborators.[518] This overall situation results in a lack of resources and/or incentives to comply with

[514] Ananya Roy and Nezar AlSayyad, *Urban Informality: Transnational Perspectives from the Middle East, Latin America, and South Asia* (Lexington Books, 2004).
[515] International Labour Organization (ILO), *Decent Work and the Informal Economy* (Geneva, Switzerland: International Labour Organization (ILO), 2002).
[516] Abhimanyu Kumar, "How the Dream of 'Clean India' Ignores Ragpickers Who Work for Little Money and No Rights", *Youth Ki Awaaz* 2016, https://www.youthkiawaaz.com/2016/03/ragpickers-in-india-shashi-bhushan-pandit-interview/(last accessed April 10, 2019); Bose and Bhattacharya, "Why Ragpickers, Unrecognised and Unpaid, Are Critical for Waste Management in India"; Centre for Equity Studies, *India Exclusion Report 2016* (Z-Atlantic Publisher, 2017).
[517] Chaturvedi, Arora, and Kilguss, "E-Waste Recycling in India–Bridging the Formal–Informal Divide", 205.
[518] Ibid., 213.

rules and regulations necessary to become part of the formal sector. In this way, informal workers become an invisible workforce, which only becomes visible when it stops working.[519]

Delhi's waste workers are often engaged in risky and harmful work, with a lack of minimum protective equipment, exposing them to specific occupational health risks and injuries such as infectious diseases or parasites. MSW is often mixed with faecal matter, medical or other hazardous wastes.

> Uma: Our working conditions, which were already bad to begin with, have deteriorated further. We are often sick. Especially our children are often sick. And we have no security. We cannot afford to not work. We need the money. Going through the dirt and food waste and sanitary waste of other people is not good. With our bare hands, we have to touch all of your waste. It is often very smelly and we all fall sick more and more often. If the waste was segregated it would make things better. (WW, Uma, 24, South Extension II, July 7, 2017)
>
> Salam: We don't have gloves or something to cover our mouth. It is all very simple. The children play close to the waste and often fall sick. I have been sick often. (…) I cannot afford to buy protection. (WW, Salam, 26, East Delhi, May 14, 2017)
>
> Pintu: When we receive the waste in different fractions it makes our work easier. Often people just give their waste in one plastic bag and then we have to go through the entire waste and sort it on our own. It is very smelly and dirty. (WW, Pintu, 30, Uday Park, April 5, 2017)

"Punctures caused by pieces of glass, needles or other objects are very common. This can lead to infections, tetanus, hepatitis or HIV, especially if the wastes contain hazardous and medical materials."[520] There are additional risks as the working and living environments of waste workers usually overlap, combining unhygienic conditions with the risk of accidents. The exposure is therefore related to the content of the material as well as to emissions from those materials, creating pulmonary diseases.[521] The waste workers' activities can also have an impact on the environment: waste workers often scatter the content of the collected material in order to salvage material of value, which can have an adverse impact on the surroundings. The improper dismantling of waste adds to the adverse dynamic.

The lack of social security entitlements is a crucial point when talking about the situation of waste workers. Waste workers do not work on a regular wage basis but are dependent on external factors (such as their participation in networks and the location in which they operate) and their individual strength. The absence of any sort of security entitlements leads to

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[519] Ibid., 206; Catherine Kuchta-Helbling, Second Global Assembly, John D Sullivan et al., "Background Paper--Barriers to Participation: The Informal Sector in Emerging Democracies", *Centre for International Private Enterprise* (2000).

[520] UN-Habitat, *Solid Waste Management in the World's Cities*, 15.

[521] Sandra Cointreau, *Occupational and Environmental Health Issues of Solid Waste Management: Special Emphasis on Middle-and Lower-Income Countries* (Washington, D.C.: The World Bank Group, 2006); UN-Habitat, *Solid Waste Management in the World's Cities*, 14-17.

momentous consequences for the workers in sickness, old age, disablement or any other circumstances that have a negative influence on their working conditions. The present research revealed that while most of the waste workers interviewed are well aware of the uncertain and difficult work situation they are in and are constantly looking for a way out of this work, they certainly don't want their children to work with waste. Titu, a twenty-four-year-old waste worker from Masjid Moth in south Delhi, states that "I would not have any of my children work in this field. I hope they have other choices, which I did not have but hope to be able to provide them with through my work with waste. I would like to work in an office one day, as a helper."[522] "I have a daughter and a son, I never want them to do this work. (…). It's not a good work"[523], responds Sikander, when being asked about the future of his children.

While working with waste poses risks in terms of the health of waste workers and the environment, their contributions, although unlicensed and untaxed, to the economic, social and ecological structures of Delhi are substantial.[524] The socio-economic value of informal waste work is, as mentioned earlier, essential, as work with waste provides a livelihood for Delhi's urban poor. The economic contribution of waste workers is usually underestimated. As far back as 2003, Chintan estimated that informal waste workers collect a minimum of 2,500 tonnes of MSW per day, saving the municipalities rupees 600,000 per day, which amounts to around 219 million rupees annually, if the waste workers were to be payed minimum wages.[525] With both the number of Delhi's waste workers and the amount of MSW being generated increasing, this figure has likely increased in the past decade. Diverting over 25 per cent of all waste generated in Delhi from disposal and into recycling of materials, the environmental value of the waste workers' activities is substantial. With Delhi's informal waste pickers collecting a minimum of 2,500 tonnes per day, they contribute to a circular economy and thereby reduce the pressure on resources.[526] Around 20 per cent of the waste generated daily in Delhi is being collected by informal workers. In 2009 itself, Chintan estimated a reduction of nine hundred thousand tons of CO_2 per year by free-of- cost recycling

[522] WW, Titu, 24, Masjid Moth, April 26, 2017.
[523] WW, Sikander, 24, Masjid Moth, April 21, 2017.
[524] Chaturvedi, Arora, and Kilguss, "E-Waste Recycling in India–Bridging the Formal–Informal Divide", 208.
[525] Chintan, *Space for Waste Planning for the Informal Recycling Sector*, 1+11.
[526] de Bercegol, Cavé, and Nguyen Thai Huyen, "Informal Recycling Vs Municipal Waste Service in Asian Cities: Opposition or Integration to Municipal Service?", 8.

of MSW by Delhi's informal waste workers.[527] At the same time, facilitating reduction and reuse of MSW through informal workers creates a market for repaired and reused goods.[528]

Structure and Mode of Operation

Throughout the last decades, waste activities in Delhi have been subject to huge changes. In the past, it was mainly members of the *balmiki* community, as earlier mentioned, who were involved in the waste activities of the city. Apart from municipal refuse disposal, two occupational groups of informal waste workers were working in salvaging until thirty years ago: the *bartanwallahs* and the *kabariwallahs*. The *bartanwallahs* on the one hand were trading with kitchen utensils and were trading these against saris or old clothes. The *kabariwallahs* on the other hand were especially engaged in the abbroachement of old metal, glass bottles and jewellery. With industrialisation, the production of consumer goods has risen enormously, and the higher amount of recyclable material which has entered the cycle of the waste system has become a productive and lucrative business. As a result, the extent and the amount of activities in the refuse recycle sector has changed significantly. Today, there are several different activities within the waste management sector that are carried out by various actors.

The workforce involved in the process of informal municipal solid waste management in Delhi is a network consisting of collectors, sorters, buyers and sellers. Their labelling by specific roles in the informal waste economy varies by sources: the literature and articles on informal waste workers in India offer a variety of terminologies to describe the waste workers' roles, ranging from very specific naming to rather rough naming of their roles.[529] The details that follow are established on the outcome of interviews with waste workers and how they label themselves and others.

As outlined in Figure 2, the whole process can be seen as a chain in which households, offices, markets and industries are the main waste producers and generators in the city. The household members or servants or other people working at the point of waste generation sometimes pre-sort the waste and pick out the recyclable material. But the recyclables do not always get pre-sorted and can therefore be found in the door-to-door collected waste, the municipal waste bins, landfill sites or other places where the waste is just deposited. Here the

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[527] Chintan, *Cooling Agents: The Impact on the Informal Recycling Sector on Carbon Emissions*, 5.

[528] Chaturvedi, Vijayalakshmi, and Nijhawan, *Scenarios of Waste and Resource Management: For Cities in India and Elsewhere*, 13.

[529] Kaveri Gill, *Of Poverty and Plastic: Scavenging and Scrap Trading Entrepreneurs in India's Urban Informal Economy* (Oxford University Press, 2009); Gidwani and Reddy, "The Afterlives of "Waste": Notes from India for a Minor History of Capitalist Surplus"; Chaturvedi and Gidwani, "The Right to Waste: Informal Sector Recyclers and Struggles for Social Justice in Post-Reform Urban India"; Aman Sethi, "Waste and Wealth", *Frontline* 23, no. 7 (2006).

waste pickers and waste collectors find their niche as they are either involved in the DTDC or they search through the refuse to find usable *maal,* which is anything that is of some value such as recyclable waste. In designated areas, the waste collectors gather MSW in order to sort it. This often happens on the basis of internal arrangements, as also with RWAs. One can differentiate between two categories of waste pickers. One category is called the street picker, who combs through the bins to find all the material that is possibly recyclable. The second category is the dump picker, whose areas of activity are the landfills. When a new load of municipal solid waste gets unloaded on the municipal landfills, the dump picker is the one who collects any recyclable material.

The waste pickers and waste collectors sell the waste to a small *kabari* (the waste dealer), or to a medium scale waste dealer, who both play a major role in the whole process. The small-scale waste dealers are generally family-run businesses and their shops can be found all over the city of Delhi, mostly close to the deliverer of the material.

> In the early 1990s, a *kabari* in Delhi had more space in which to operate, as well as more clients. And there were more *kabaris* in the center of the city, where the urban elite live and work. Today, most *kabaris* have been evicted from areas in the city's center. Where *kabaris* continue to operate, they do so under severe space constraints and average no more than seven waste pickers as clients.[530]

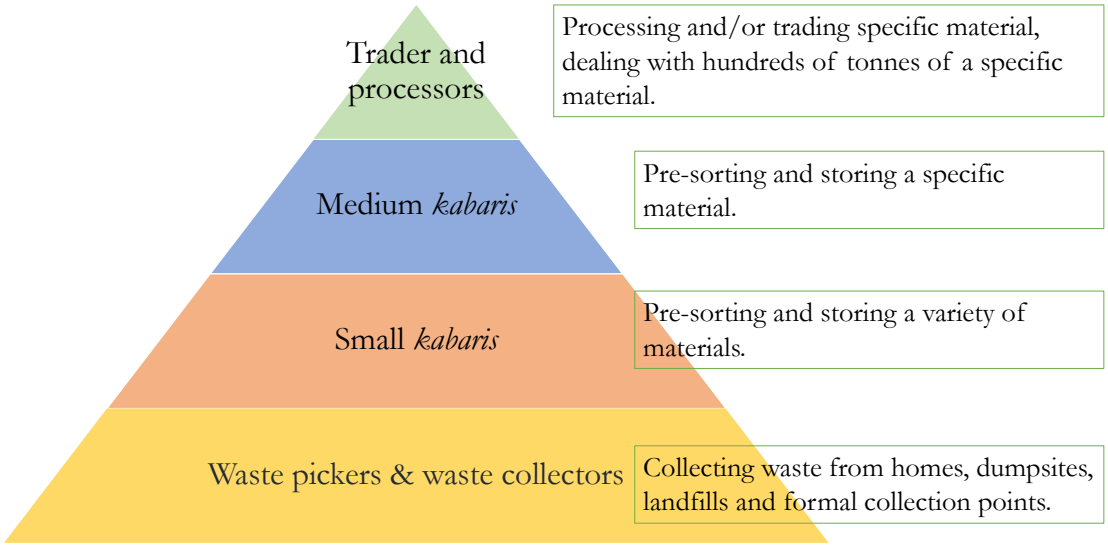
The medium scale waste dealer usually has regular employees who segregate and pre-sort the recyclables and work on a monthly salary. Both small and medium dealers store and sell the recyclable material, but the medium scale waste dealers generally store one particular material until they can sell it all together to a big *kabari*, a large-scale waste dealer or a retailer. These wholesalers own large enterprises, which are generally situated at the margins of Delhi, since the huge amounts of recyclable material need a lot of space. The retailers are mostly specialised in one material, such as paper or plastic. Both sell their pre-sorted material to the recycling industries, which finally recycle the material and feed it back into the recovered substance cycle.

The informal MSW economy in Delhi is organised in a hierarchy based on scale, taking the shape of a pyramid. As depicted in Figure 7, the base of this pyramid consists of Delhi's *kudhawallahs* or *kachrawallahs* (a person collecting waste), the waste pickers and waste collectors, who collect and segregate waste from homes and search *dhalaos*, landfills and collection points for *maal*. Numbering 120,000 to 135,000 men, women and children, these workers represent the largest occupational groups in this informal economy. At the second layer are

[530] Chaturvedi and Gidwani, "The Right to Waste: Informal Sector Recyclers and Struggles for Social Justice in Post-Reform Urban India", 133.

the small scale *kabaris*, who are specified scrap collectors who buy waste from the waste pickers or collectors. Small scale *kabariwallahs* usually own a shop where they can collect and store a variety of material, such as paper, glass or plastic and metal. The third layer consists of medium-scale waste *kabaris* who usually focus on a specific material to sell to the fourth layer of the pyramid, the traders and processors, who buy the recyclable material from the small or medium dealers, and who own huge grounds to sort out the material. Through these wholesalers the material is further sold to recycling units and factories.[531]

Figure 7: The waste hierarchy of Delhi's informal MSW economy



Source: Author's own, based on CHINTAN (2007): 5; and Köberlein (2003), 90–102.

In order to address these and other issues related to the informal waste workers' working conditions and rights, Delhi's waste workers have organised themselves in unions, alliances or coalitions, which either have a nation-wide or Delhi-wide outreach, such as the Alliance of Indian Wastepickers (AIW), the All India Kabadi Mazdoor Mahasangh (All India Rag-pickers Union (AIKMM)) or The Kachra Kamgar Union, Delhi or Bal Vikas Dhara. These work to organise informal waste workers, ensuring their access to livelihoods and social security. One of the objectives is to work towards the inclusion of informal waste workers, in particular, in various social security schemes. Their empowerment through organising can strengthen their position vis-à-vis the formal private sector and the government. They can gain stability and legalisation through cooperation. Also, as a cooperative they can enter into

[531] Köberlein, *Living from Waste: Livelihoods of the Actors Involved in Delhi's Informal Waste Recycling Economy*, 90-102; Chintan, *Wasting Our Local Resources. The Need for Inclusive Waste Management Policy in India* (New Delhi: Chintan Environmental Research and Action Group, 2007) 5.

contracts with the industry or grant agreements with donors or recycling programmes with separation at source.[532] There are examples from Delhi in which the power relations between all involved actors has changed due to the existing formations of Delhi's waste workers. This has led to waste picker organisations having informal agreements or formal contracts with formal sector actors and neighbourhood organisations to gain access to recyclable materials or to sell materials or manufactured items. In public–private partnerships, Delhi's municipalities are to provide infrastructure, equipment and labour to waste workers. With the SWM Rules, 2016, waste workers are recognised as legitimate stakeholders, and their work with waste being their occupation. "Legalizing waste-picking activities, preferably at the national level, is usually a first significant step toward improving the lot of waste pickers."[533]

The Informal Waste Workers' Backgrounds

Economic factors lead people to become waste workers. They belong to vulnerable groups—Delhi's waste workers comprise recent migrants, unemployed, disabled, children, women and elderly. According to Köberlein "[a]pproximately 30% of the waste pickers and around 40% of the waste workers [*kabaris*] are women."[534] It is unusual for women to work as waste dealers or have any other higher position in the waste recycling circle. There are many reasons for this. For example, women are not able to carry or move such large and heavy amounts of waste material, or they are generally responsible for taking care of the children and the household rather than working with refuse. Also, the women interviewed in the framework of this research sort waste at home or at a place outside, as they are not expected to collect waste. The age framework differs from occupation to occupation and is mostly dependent on the experience the worker has in the specific activity in terms of knowledge and network or connections.

The share of the people working in the informal waste economy who migrated from other regions within India, or even from another country, is high: over 90 per cent of the workers are not from Delhi. Most of them come from Uttar Pradesh, West Bengal, Bihar or Bangladesh, and have moved to the city to find a better income generating activity so that they can support their family. There is a small number of people from Nepal who are occupied in different activities of the informal waste recycling sector. An interesting observation is that the workers in the occupational groups of wholesalers and large-scale waste dealers have the longest duration of stay in Delhi. This is related to the fact that the large-scale dealers as well

532 Martin Medina, "The Informal Recycling Sector in Developing Countries: Organizing Waste Pickers to Enhance Their Impact", *Gridlines*, no. 4 (2008).
533 Ibid., 2.
534 Köberlein, *Living from Waste: Livelihoods of the Actors Involved in Delhi's Informal Waste Recycling Economy*, 115.

as the wholesalers need a dense network and connections to run the business, and a certain minimum amount of time is needed to establish this kind of business in the informal economy. Contrary to this is the group of the waste pickers and waste collectors: the job of the waste picker is often a starting point for migrants who come to Delhi. Many of the waste pickers have not been living in the city for longer than two years. While the number of people who originally belong to Delhi and who work in the informal waste management economy is comparably small, it is important to mention that an estimated 50 per cent of the wholesalers are Delhiites. Again, this obviously is connected to the earlier mentioned reason that a network and many connections are indispensable in that sector, and a Delhiite naturally has the required bonds within the area.

The majority of people who are occupied with the refuse work are Muslim. Among the waste pickers, waste collectors and small and medium scale waste dealers, Muslims are estimated to constitute above 50 per cent. Especially in the occupational groups of the *kabaris,* the percentage is as high as 74 to 81 per cent. On a percentage basis, the number of Hindus within the occupational groups of the waste economy is considerably higher in the wholesalers and the retailers groups. The cultural value of impurity is the main factor in this context. As mentioned earlier, work with waste and the nature of waste itself is seen as something impure and unclean. Wholesalers and retailers usually have employees who work directly with the waste material, and so the Hindu, who is a wholesaler or a retailer, does not come into any contact with the refuse during the work. Hindus who do work with waste and are occupied with either waste picking, collecting or waste in general, belong to lower *jatis* (a caste or subcaste), *shudras* (labourers or service providers and the fourth *varna* [the social class or caste]) or scheduled castes. Even in the past, these groups were assigned to work with waste and are therefore in a way stigmatised by doing this 'impure' work.[535]

Box 11: India's waste culture - The example of Delhi's informal waste workers

The following quotes are from interviews at the community level and with the waste workers. The interviewee was being asked how he or she would describe the interaction with either the person who collects the waste or with the person from where the waste is being collected and which underline "(…) how little Delhi's empowered residents care about other, [so-called] lesser citizens (…)?"[536].

[535] Ibid.
[536] Chaturvedi, *Finding Delhi: Loss and Renewal in the Megacity*, xii.

Chitra: "I just give him the bins. I don't interact at all. Why should I talk to him?" (Chitra, sixty-one, South Extension II, May 5, 2017)

Ritu: "I would say there is no interaction, if not necessary. Only when he does not show up, then I would talk the next time he appears." (Ritu, fifty-three, Friends Colony West, June 3, 2017)

Raghav: "Sometimes I ask him if everything is alright, but normally I don't interact. Not that I don't want to, but often the timings do not fit." (Raghav, forty-four, New Friends Colony, July 5, 2017)

Arjun: "I avoid the contact. My maid gives him the waste." (Arjun, thirty-five, Uday Park, June 2, 2017)

Salam: "People just dump their bags outside of their door when I ring the bell. Mostly they don't talk." (WW, Salam, twenty-four, East Delhi, May 14, 2017)

Pintu: "I only sometimes face problems. Usually people are nice. It is ok". (WW, Pintu, 30, Uday Park, April 5, 2017)

Sikander: "Sometimes people on the street shout at me that I should go out of their way. I usually would say something, but because of my work I can't. It's not a good situation." (WW, Sikander, twenty-four, Masjid Moth, April 21, 2017)

Source: Author's own.

Delhi's Formal MSW Economy

Delhi (in 2016) consists of five municipalities comprising 280 wards, which altogether generate around 9,500 TPD. According to the municipalities, around 8,000 TPD of MSW are collected and either brought to one of the three landfill sites at Bhalswa, Okhla and Ghazipur, or treated in one of the two WtE plants or two functioning centralised composting plants.[537] The involvement of formal private sector actors in a variety of stages of the MSW economy in Delhi has increased gradually since the beginning of the twenty-first century. Starting with the collection of MSW from municipal *dhalaos* and collection points, to the transportation of MSW to landfills and treatment facilities, reaching to the collection of MSW from e source, the privatisation of elements of the MSWM system is manifested by the continuous outsourcing of these services by the ULBs to private agencies. Delhi's municipalities form public–private partnership (PPP) for the privatisation of elements of the waste management chain. These partnerships have become the common vehicle and contractual agreement for

[537] Narain and Singh Sambyal, *Not in My Backyard. Solid Waste Management in Indian Cities*.

this undertaking. Since the turn of the millennium, "(…) court rulings driven by PILs set the stage for its municipalities to transfer solid waste management to large corporations rather than to small private contractors."[538] In large parts of Delhi, the collection and transportation of MSW, waste treatment as well as the disposal of MSW, are being operated by formal private sector players.

Since 2005, the MCDs have established privatised secondary collection and transportation of MSW from *dhalaos* in six out of thirteen zones of their jurisdictions that amounted to more than 50 per cent of the MCD's overall jurisdiction area. The corporation itself is in charge of collection and transportation of MSW in four zones, while the other zones are being taken care of by the informal workers.

Delhi's experience with waste-to-energy plants goes back to 1987, when the first WtE plant in Delhi was commissioned with a capacity to process 300 TPD. However, this plant closed down in 1990 for a variety of reasons, such as poor planning and project structuring, lack of financial viability assessment, composition of the waste with low calorific value, lack of inter-institutional cooperation and coordination, and loose implementation of the contracts and laws. "The reasons for the initial failure of the Timarpur project were analyzed and subsequently, the Department of Science and Technology, GOI successfully developed and demonstrated the technology for MSW that was suitable for Indian conditions (…)."[539] In 2010, when laying down the foundation of the Timarpur-Okhla WtE plant, the then-chief minister Sheila Dikshit stated in regard to the failed Timarpur WtE plant: "That project was initiated over a decade back, with technology imported from a European country. But the calorific value of waste produced here was different from that in Europe and the plant turned out to be a mistake"[540]

In 2016, Delhi had already commissioned two waste-to-energy plants and one is in the planning stage: the WtE plant in Okhla, which was commissioned in 2011, is operated by Timarpur–Okhla Waste Management Co. Pvt. Ltd. (TOWMCL) of Jindal Urban Infrastructure Limited (JUIL) in a public–private partnership agreement. The Jindal plant has a processing capacity of 2,000 TPD to generate sixteen MW. With the original capacity of processing 2,000 metric tonnes (MT) a day, officials had great hope of reducing the daily generated amount of MSW in Delhi. However, by January 2016, the Jindal WtE plant processed

538 Chaturvedi and Gidwani, "The Right to Waste: Informal Sector Recyclers and Struggles for Social Justice in Post-Reform Urban India", 139.
539 Ministry of Finance, *Position Paper on the Solid Waste Management Sector in India*, 58.
540 "Delhi to Get Country's First Waste-to-Power Plant", *Business Standard*, June 27, 2010, https://www.business-standard.com/article/economy-policy/delhi-to-get-country-s-first-waste-to-power-plant-110062700009_1.html (last accessed May 3, 2019).

1,165 tonnes, which is just above 50 per cent of what was planned.[541] The reasons for that are manifold, ranging from technical to financial problems: as mentioned before, Delhi's MSW is high in organic material and in inert content, which leads to a low calorific value of the waste. For energy generation through incineration, a minimum calorific value is required, otherwise the waste is unfit for burning. The quality of the incoming waste is not fit for the incineration process as the MSW being sent for incineration is unsegregated. Between 2011 and 2015, an average of 69 per cent of the incoming waste at the Jindal waste-to-energy plant was biodegradable waste, and only 30 per cent was waste with high calorific value. The second waste-to-energy plant, which was commissioned after a four-year delay, was opened in a joint venture between the Delhi government and another private sector actor, Infrastructure Leasing and Financial Services Limited (IL&FS) Environmental Infrastructure and Services Ltd., in Ghazipur in 2016. The processing capacity of this plant is supposed to be 1,500 tonnes. The third WtE plant which is RDF-based is being planned by North Delhi Municipal Corporation in a PPP with Ramky Enviro Engineers Limited, in which Ramky will operate an RDF plant to process 700 TPD MSW.

Delhi has three centralised composting plants at Bhalswa, Okhla and Narela–Bawana. Of these, only the two in Okhla and Narela–Bawana are running. The composting plant in Bhalswa was terminated in 2015 by the North Delhi Municipal Corporation.[542] Both the functioning composting plants are operated in a public–private partnership model. The SDMC composting plant in Okhla, which is operational since 2007 by IL&FS in a PPP model, has a process capacity of five hundred TPD, an amount of waste which is, according to IL&FS itself, also processed.[543] However, in January 2016, the plant processed an estimated amount of 161 TPD.[544] The reason for this is that, just like the WtE plant in Okhla, the Okhla composting plant receives unsegregated waste which impacts the efficiency of the plant immensely. The analysis of the processing capacity data of the different MSW treatment infrastructures in Delhi shows that the data related to the functioning of the different treatment facilities varies depending on the source of information. While the official documents refer to the target capacity when referring to the present status of the processing capacity of the respective infrastructure, most other documentation draws a different picture in which

[541] Rémi de Bercegol, "Rethinking "Modernisation" of Waste Sector in Delhi", in *Valuing Waste or Wasting value? Rethinking waste processing in fast growing middle-income cities* (New Delhi: The CPR Scaling City Institutions for Sanitation programme and Agence Française de Développement, 2018).
[542] P. "Contract with Company Running Bhalswa Compost Plant in Delhi Terminated".
[543] IL&FS Environment Infrastructure & Services Limited, "The Okhla Waste Processing Facility", IL&FS Environment Infrastructure & Services Limited, http://ilfsenv.com/Brochures/Okhla-Compost-Facility.pdf (last accessed April 10, 2019).
[544] de Bercegol, "Rethinking "Modernisation" of Waste Sector in Delhi".

the present status of the processing capacity of an MSW treatment facility is below the target capacity, often by more than 50 per cent.

In the past years an additional factor has entered this economy which is otherwise increasingly being ruled by large waste management companies: small private formal companies continue to enter the Delhi MSWM economy, such as Raddi Express, Raddi Bazar, The Kabadiwala or Pompom. "These latter (…) have begun to engage in the recycling sector, following directly the same dynamics by innovating with an online application to facilitate the sale of waste by its users to the company (which comes directly to their home to collect it and eventually resell it to the informal chain of recycling industries)."[545]

> The reuse and recycling chain, which is only informal at its bottom (and then connects to formal traders and huge industries) does appear as an existing mechanism that reduces the resources wastage and contributes to a more circular economy. (…) The linear economy for the sanitary disposal of urban waste appears more and more unsustainable and tends thus to be slowly replaced by new policies favouring the recovery of waste-resources. (…) In Delhi, the modern replication by small formal private enterprises of the traditional Kabadiwala waste collection system is in itself a proof of its efficiency, which clearly demonstrates the essential role that the recycling agents can play. Like in many cities, "informal" channels of retrieval have been in existence for a long time, contributing to a circularity of flows that reduce environmental pressure, and may even be considered more efficient than formal "modernized" services"[546]

Realising the valuable synergies between the formal and informal waste economies is an essential element in Delhi's waste management transformation. Another element which is crucial is the role of the product manufacturer: when analysing the formal private actors involved in Delhi's MSWM, the focus is often on the aspects of collection, transportation and treatment of MSW. However, when considering a product life-cycle and the waste hierarchy, it is essential to also consider the product manufacturers who are at the beginning of the waste chain and play a crucial role at the front-end of the product. Their products, and more so the packaging of the products, eventually result in waste. As outlined earlier, the product manufacturers and their role in the waste management economy are often not sufficiently considered in the policy framework.

5.1.3. Civil Society & Community

Delhi's civil society is composed of individual citizens as well as civil society representatives who are active under the umbrella of an NGO, for example. Delhi's actors from civil society

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[545] de Bercegol, Cavé, and Nguyen Thai Huyen, "Informal Recycling Vs Municipal Waste Service in Asian Cities: Opposition or Integration to Municipal Service?", 9.

[546] Ibid., 11; Gidwani and Reddy, "The Afterlives of "Waste": Notes from India for a Minor History of Capitalist Surplus"; David C Wilson, Costas Velis, and Chris Cheeseman, "Role of Informal Sector Recycling in Waste Management in Developing Countries", *Habitat international* 30, no. 4 (2006).

and at the community level who are involved in the city's MSWM are diverse and active. Civil society, comprising each and every inhabitant, plays a crucial role as waste generators: the generators of waste in households and commercial complexes are legally obliged to store segregated wastes at source and hand these over to designated waste collectors for recycling, processing and disposal.[547] Since source segregation is the key to sustainable waste management, citizens have a huge responsibility. The interviews at the community level reveal a certain demand or desire for more knowledge and communication when it comes to MSW. Especially when considering the mandatory source segregation, which is part of the SWM Rules, 2016, interviewees mention the need for more clarity. Thirty-seven-year-old Siya stated that "[w]aste management or even something like waste segregation and how to do it are not part of my daughter's school syllabus. For me it is not clear why. If this system is not understood by the children, who will implement it later?"[548]

Delhi is home to multiple NGOs which are active in the field of environmental concerns and justice, with a major focus on Delhi's MSWM. Each NGO has a different, more specific, focus within the MSWM field: some of the NGOs, such as the Centre for Science and Environment (CSE), an NGO working on a variety of topics of which waste is only one component, cover the topic of waste by addressing institutional structures involved in waste management, treatment and disposal. Toxics Link (TL), an NGO focussing on environmental justice and freedom from toxics, concentrates on specific waste streams and materials, as well as on waste management processes and technologies and their impacts on the involved actors and environment. Besides the NGOs that look into the institutional-, process- and material-related aspects of MSW, Delhi's actor base is especially strong with NGOs working in the area of informal workers' rights. Throughout, NGOs have been the primary drivers to emphasise the significance of the activities of informal workers and have worked to organise and empower waste workers. The provision of identification documents, space for storage and segregation, or the involvement of the waste workers in policy processes through dialogue are just some of the issues which the NGOs pick up. One of the primary actors in the field of justice and rights of waste workers is Chintan, a Delhi-based NGO and environmental justice group, focussing on ensuring equitable and sustainable production and consumption of materials, and improved disposal, while at the same time working to support informal waste workers in Delhi.[549] Chintan was involved in a situation in 2001, when the registered group of waste pickers, waste collectors, *kabaris* and waste recyclers, which is now

[547] Ministry of Environment, "Solid Waste Management Rules, 2016", 208.
[548] Siya, thirty-seven, Defence Colony, July 12, 2017.
[549] Chintan, https://www.chintan-india.org/index.htm (last accessed April 9, 2019).

called *Safai Sena* and aims at ensuring the recognition and safe working conditions of waste workers, was set up in a partnership model. While the NGOs in Delhi play a crucial role in addressing existing institutional and technological structures and MSW management processes and technologies, they also pose a strong opposition to the ongoing transformation towards privatisation by organising demonstrations and filing petitions. One consistent demand which is being vocalised is for the waste workers to have access to waste.[550] Often the NGOs have close collaborations with Delhi's RWAs, which provides them with direct access to the society and the people involved:

> The close collaboration and partnerships between NGOs and RWAs in Delhi have been key in pushing the decentralisation of elements of the MSWM chain. As such, RWAs, with support by NGOs, start composting the colony's household organic waste and adjacent park waste in a decentralised manner. In some cases, the respective municipality is closely involved through providing support of the construction of the composting infrastructure and initiating a user fee system in order to maintain and operate the decentralised compost facility.[551]

5.2. Transformations of India's Waste Management Agenda and Its Impacts in Delhi—Turning Points and Crises in Delhi's MSWM Economy between 2000 and 2016

Since the beginning of the twenty-first century, India has been undergoing a policy shift regarding solid waste management, which is characterised by the promotion of formal private sector participation, and therefore increasing privatisation of certain aspects of the waste management system. Delhi has been at the forefront of this shift from the time it unfolded. The PILs from B. L. Wadhera and Almitra Patel were "[…] such public humiliation of municipal officials […] [that] drew unwelcome attention to under-performance by public bodies […] and, by the same token, ratcheted pressure on Delhi's municipalities to find new answers to the city's compounding waste. Privatization of waste handling became a real possibility for the first time."[552] Since then, Delhi's local governments, lacking capacity and facing pressures to find quick solutions, "(…) see private sector involvement in waste management as a cure-all"[553], which led to the introduction of solid waste management practices to the city's formal MSWM system. Ever since, the official narrative of the reasoning for the shift to

[550] Narain, "Garbage Is About Recycling".
[551] Singh, "No More N-I-M-B-Y"; Toxics Link, *An Initiative Towards Decentralised Solid Waste Management* (New Delhi: Toxics Link, 2009).
[552] Chaturvedi and Gidwani, "The Right to Waste: Informal Sector Recyclers and Struggles for Social Justice in Post-Reform Urban India", 135.
[553] Chaturvedi, Arora, and Saluja, "Private Sector and Waste Management in Delhi: A Political Economy Perspective", 9.

privatisation is around the private sector reducing the burden on ULBs because it has access to technologies while at the same time being cost-effective.[554]

This policy shift represents a "(…) systemic transformation (…)"[555] as it aimed at integrating the entire system into a single system. The consequences of this shift can be seen in four overlapping and continuous phases, which are outlined in brief in Figure 8, and in more detail in the following three sub-sections.[556] The consequences of this shift started to show more than a decade ago and resulted in major conflicts regarding access to waste between the formal and informal actors: with increased competition with formal waste management companies at various stages of the waste management chain, privatisation poses a major threat to the livelihood of Delhi's waste workers. The fallacy that further privatisation would fully replace informal waste workers has led to a deepening of conflicts between the informal and formal actors, and to a situation in which opportunities are being overlooked. Moreover, the informal municipal solid waste economy supports Delhi's local government in waste management, while at the same time saving substantial amounts of natural resources through efficient recycling.

> Historically, to 'own' the city's garbage—or, to be more legally exact, the garbage deposited in neighbourhood municipal bins called *dhalaos*—was a liability for municipalities since, under the municipal charter, it carried the obligation to remove it. Disposal, often costly, was a drain on strapped city budgets. Today, garbage has become an asset […]. For Urban Local Bodies (ULBs) that are under increasing pressure to become more financially self-sustained and responsible in the wake of neoliberal transformations of India's economy, this realization has sparked a rush to capitalize on waste through a variety of new ventures that, in one shape or another, privatize what was earlier a de facto 'urban commons' used free of charge by the city's poor as livelihoods.[557]

The existing limitations of the public sector, in terms of finances, skills and knowledge, gave way in the first place to the shift to privatisation without considering the role of informal waste workers. Developments in the field of privatisation have increased the already uncertain future of informal waste workers, as the privatisation of Delhi's MSWM results in waste workers losing the opportunity to earn a livelihood. The policy shift disregards the fact that traditionally, waste management provides income opportunities for 1 to 2 per cent of the

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554 Dukhan, Bourbon-Séclet, and Yannic, "Linking Public and Private Action for Sustainable Waste Management"; Chaturvedi, Arora, and Saluja, "Private Sector and Waste Management in Delhi: A Political Economy Perspective", 7.

555 Schindler, Demaria, and Pandit, "Delhi's Waste Conflict", 18.

556 While a variety of scholars, such as Chaturvedi, Arora, and Saluja, "Private Sector and Waste Management in Delhi: A Political Economy Perspective" and Schindler, Demaria, and Pandit, "Delhi's Waste Conflict" identify closed time periods for each of those phases, the author of this research identifies a starting point, an overlap and a continuity for all phases.

557 Chaturvedi and Gidwani, "The Right to Waste: Informal Sector Recyclers and Struggles for Social Justice in Post-Reform Urban India", 127.

Indian population, mostly urban poor.[558] How to safely integrate the waste workers into an integrated waste management system is a question that remains to be answered even today.

While the impacts of privatisation on Delhi's waste workers have been observed critically since the beginning, so has the involvement of international donors in the overall privatisation process and the consequences for the public sector. A variety of donors, such as the World Bank, claim that the privatisation of certain elements of MSWM is the most efficient and cost-effective way to deal with the growing amounts of waste. The role of the ULBs decreases in the process as "[p]rivate sector participation involves reducing government control, ownership and/or activity within a service (…) traditionally provided by government"[559], which is an explicit intention and objective from the donors' side, while that same lack of government ownership, involvement and activity has been identified as one of the core issues for Delhi's MSWM.[560] Critics go so far to say that:

> (…)[P]rivatisation does not primarily intend to improve public services. Rather, privatisation is a strategy of free market enthusiasts to shrink government by transferring public money, work and assets to the private sector. As its name suggests, the objective of privatisation is simply privatisation, or, to generate new business and increase revenue for the private sector.[561]

In 2005, the MoUD—while broadly promoting private sector participation in MSWM—noted that "(…) private sector participation cannot be used as a panacea for all problems. In order to attract private sector in service aspects such as collection and transportation or landfill site management, ULBs will have to put their house in order."[562]

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[558] Gidwani and Reddy, "The Afterlives of "Waste": Notes from India for a Minor History of Capitalist Surplus"; Chaturvedi and Gidwani, "The Right to Waste: Informal Sector Recyclers and Struggles for Social Justice in Post-Reform Urban India"; Chaturvedi, Vijayalakshmi, and Nijhawan, *Scenarios of Waste and Resource Management: For Cities in India and Elsewhere*; Cavé, "Urban Solid Waste in Southern Countries: From a Blurred Object to Common Pool Resources".

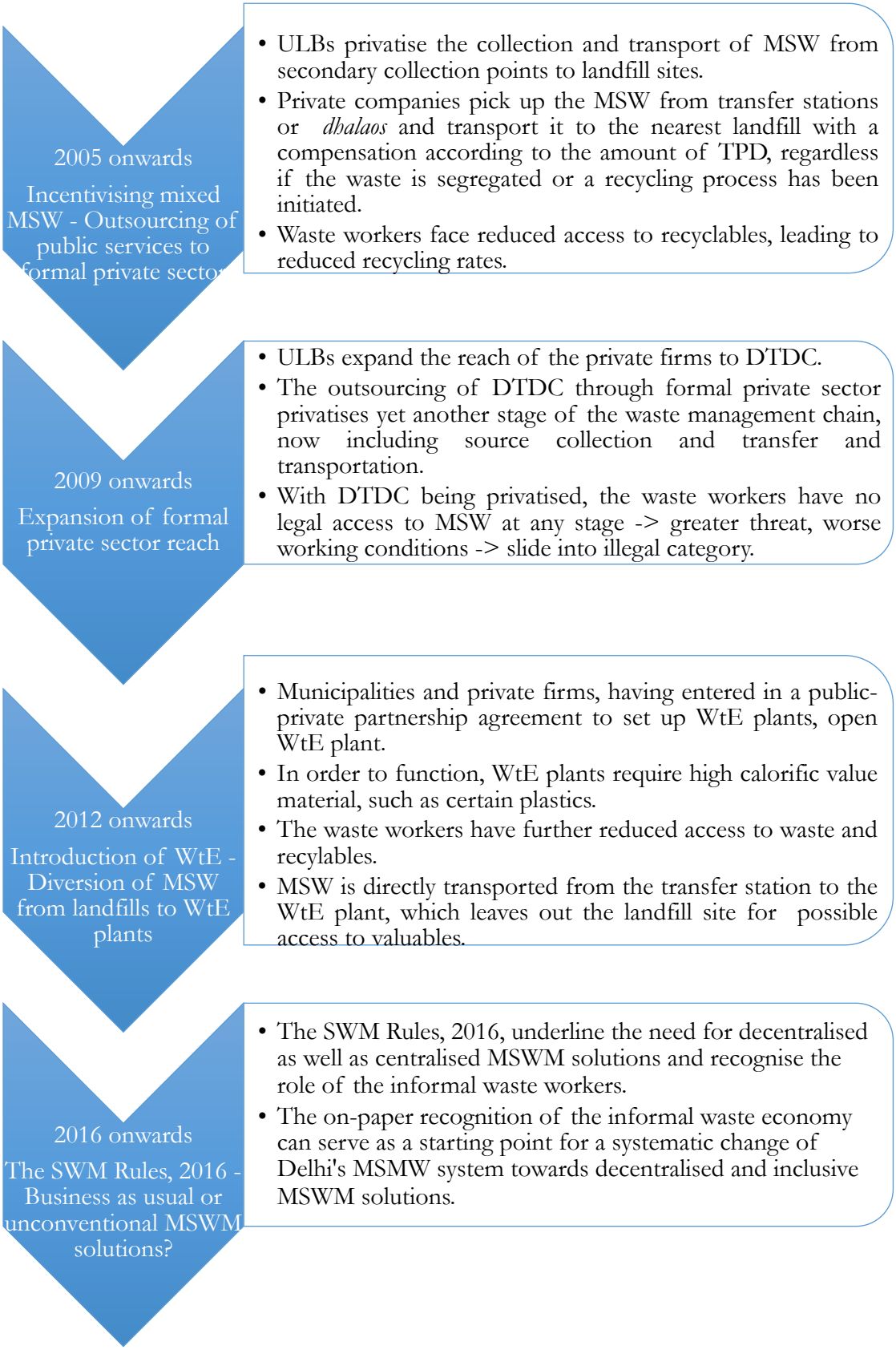
[559] Cointreau, Gopalan, and Coad, "Private Sector Participation in Municipal Solid Waste Management: Guidance Pack (5 Volumes)", 17.

[560] Anderson, "Privatisation: A Formula for Provision or Perversion of Municipal Solid Waste Management".

[561] Ibid., iii.

[562] Central Public Health & Environmental Engineering Organisation, "Report of the Technology Advisory Group on Solid Waste Management", 54.

Figure 8: Transformation periods in Delhi's MSW economy



Source: Author's own, based on Chaturvedi, Arora, and Singh Saluja (2015), 11–12; Schindler, Demaria, and Pandit (2012), 19.

5.2.1. The Incentivisation of Unsegregated Waste: The Beginnings of Delhi's MSWM Privatisation

In the first phase beginning in 2005, the then three municipalities that oversaw Delhi involved private companies by publishing tenders for collection, segregation and transport of waste from secondary collection points to landfill sites. The companies had to bid for the waste and they received the fee for the collection of the waste—the idea being that the waste becomes the private property of the companies once it reaches the transfer station or the *dhalao*.

> The municipal contract with large private companies requires them to gather waste from neighbourhood collection points and transport it to landfills. (…) their contracts also include the Ownership and Control of Recyclable Wastes (Article 5.15. of the Contract) and Control and Rights over the Dhalao Space, including advertising rights. The agreement, in essence, awards corporate contractors three sources of revenue: the waste matter itself, the bin or neighbourhood dump space, and municipal payments for collection and transportation of garbage.[563]

The private firms would then collect the MSW from there and transport it to the nearest landfill. The crux here is the payment mechanism, as the firms would get compensated according to the quantity of waste they transport: the more tonnes of waste they dispose at the landfill per day, the higher the payment. This 'tipping fee', as it is called, led to a scenario in which unsegregated waste effectively means more money than segregated waste, which had a huge impact on Delhi's recycling economy and the work of the waste workers.[564] Many environmental and social justice activists and NGOs have expressed resentment against this "perverse incentive"[565] and disincentivisation of recycling and segregation of MSW.[566] By 2010, however, the ULBs had outsourced the service of collection of MSW in approximately 50 per cent of the total area to four private companies under a PPP agreement with the city authorities.[567] While the ongoing privatisation of Delhi's MSWM services is often critically observed by various scholars and social activists, institutions like the World Bank and others claim that the privatisation of certain aspects of the waste management chain saves a significant amount of the taxpayers' money. This is because the cost of transportation by companies is usually 20 to 40 per cent lower as compared to government agencies, which is also the

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563 Chaturvedi and Gidwani, "The Right to Waste: Informal Sector Recyclers and Struggles for Social Justice in Post-Reform Urban India", 140.
564 Gidwani and Reddy, "The Afterlives of "Waste": Notes from India for a Minor History of Capitalist Surplus", 1636.
565 Sunita Narain, director general of Centre for Science and Environment (CSE) at the launch of Not In My Backyard at India Habitat Centre, July 12, 2016, New Delhi.
566 Sethi, "Waste and Wealth".
567 UN-Habitat, *Solid Waste Management in the World's Cities*, 58.

case in Delhi.[568] The reason is that the companies pay relatively lower than minimum wages to their sanitary workers.[569]

As the collection was restricted to secondary collection points, this system gave at least some space to informal waste workers as they were allowed to collect from the source. Nevertheless, since the formal contracts were based on incentives related to the quantity of waste which was transported to the landfills, it led to various social and environmental challenges as the access to waste for the informal actors became increasingly restricted and the question of who owns the waste got more pressing. The outsourcing of the collection and transport of MSW to landfills had immense and lasting impacts, not only on the plight of waste workers, but also on the recycling situation in Delhi altogether.

With the *dhalao* and transfer stations becoming the purview of waste management companies, waste workers started to face reduced access to waste, which became the private property of the firms once it reached the transfer station or *dhalao*. "The informal social sharing mechanisms that promoted a certain degree of equity in earnings across waste pickers have begun to fray."[570] Until then the waste workers were able to utilise the space in the bin area for the segregation of MSW in order to filter out valuable recyclables. The privatisation of this however disrupted the previously functioning recovery of recyclable material. The contracted waste management companies hired bin guides to oversee and maintain each *dhalao*, who denied the waste workers the usage of the *dhalao* space to segregate their waste and dispose their non-recyclables at the *dhalao*. Along with this, the privatisation of collection therefore eventually led to poorer MSW segregation as the private companies, being compensated according to the amount of waste delivered to the landfills, competed with the informal waste workers for waste. While the informal waste workers previously segregated between 15 to 60 per cent of Delhi's MSW, private companies were allowed to segregate at a rate of 20 per cent over an eight-year contract, which led to a reduction of Delhi's recycling rates.[571] Moreover, the private contractors who segregate the MSW for recyclables sell the material directly to the recycling factories or large dealers, which results in small-junk and

[568] Somvanshi, "The Economy and Politics of Solid Waste in Delhi. A Rotten Deal for Ragpickers".
[569] Hanrahan, Srivastava, and Ramakrishna, *Improving Management of Municipal Solid Waste in India: Overview and Challenges*, 21.
[570] Gidwani and Reddy, "The Afterlives of "Waste": Notes from India for a Minor History of Capitalist Surplus", 1637.
[571] Chaturvedi and Gidwani, "The Right to Waste: Informal Sector Recyclers and Struggles for Social Justice in Post-Reform Urban India", 140-42.

scrap dealers being out of work.[572] In addition, the lack of space to efficiently segregate waste led to the fact that

> (…) many pickers have begun to complain that the privately employed bin guide, on orders from management, no longer permits them to segregate their own waste in the bin area; nor dispose the remains of post-segregation waste in the dhalao. As such, they are forced to travel longer distances to find spots where they can sift through their maal ('stuff') and throw post-segregation chaff.[573]

In 2008, the entire conflict about access to waste, access to ownership of waste and access to bin areas led to a perverse situation in one area of the NDMC's jurisdiction: two years after MSW collection and transport had been privatised, the private companies began to charge the waste workers for searching through the *dhalao* for recyclables. Through this mechanism, the private firms tried to compensate the reduced amount of MSW, which would eventually also mean a reduced amount of money, as private firms got compensated against the amount they delivered. As a result, the waste workers were not only subjected to more harassment by municipal field staff and the police than before privatisation, they also in this case needed to pay money in order to utilise the space and search for recyclables.[574]

A combination of factors led to these developments of outsourcing MSWM services in the first place: first,

> (…) court rulings driven by PILs set the stage for municipalities to transfer solid waste management to large corporations rather than to small private contractors. By 2005, 6 of 13 zones in MCD's jurisdiction—accounting for almost 50% of the municipality's jurisdiction—had already converted to privatised collection and transportation of waste.[575]

Second, the Master Plan for Delhi, 2021, which had been published by the Delhi Development Authority and was notified by the Central Government on February 7, 2007, stated the vision of making "(…) Delhi a global metropolis and a world-class city, where all the people would be engaged in productive work with a better quality of life, living in a sustainable environment"[576], and therefore added to the need for a structural change in Delhi's MSWM economy. While the plan indeed acknowledges that "(…) [r]ecycling should be preferred than disposing off the waste in sanitary landfill sites (…)"[577] as it is, it at the same time envisages vision and policy guidelines for the period until 2021 with an inherent focus on infrastructural development for solid waste management facilities, such as sanitary landfills and

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572 Gidwani and Reddy, "The Afterlives of "Waste": Notes from India for a Minor History of Capitalist Surplus".
573 Ibid., 1637.
574 Somvanshi, "The Economy and Politics of Solid Waste in Delhi. A Rotten Deal for Ragpickers".
575 Chaturvedi and Gidwani, "The Right to Waste: Informal Sector Recyclers and Struggles for Social Justice in Post-Reform Urban India", 139.
576 Delhi Development Authority (DDA), *Master Plan for Delhi - 2021*, 2.
577 Ibid., 173.

public–private partnerships for large waste management projects.[578] In the action plans, "(…) the current approval procedure for waste management facilities (and others)"[579] is the sole identified implementation issue which captures the level of understanding of environmental, structural, technological, social and sustainability concerns related to the viability of WtE plants in India. Third, the fact that Delhi was to host the Commonwealth Games, 2010, further increased pressure on the city's ULBs to ensure a functioning MSWM economy which, considering the existing governance gaps in the MSWM of the local government, posed a challenge.[580]

5.2.2. Municipal Solid Waste Management as a Profitable Business: the Privatisation of Door-to-Door Collection

The second phase began in 2009, when the then MCD outsourced DTDC to formal private companies in selective zones under their jurisdiction.[581] Historically, Delhi's ULBs did not provide DTDC services for MSW; instead, residents either disposed their waste in the *dhalaos* themselves so that the waste could then be collected by the ULBs, or RWAs paid waste workers to collect the waste from the source. The waste workers therefore could segregate and search the waste for recyclables to then dispose the rest in the *dhalao*. With relevant stakeholders such as the MoUD stressing on DTDC being "(…) the key element for making the Solid Waste Management successful (…)"[582] since 2008 and earlier, created the ground for further extending the "(…) portal for the entry of corporate interests into the waste sector."[583]

Delhi's ULBs, expanding the role of the formal private companies to DTDC, added one more stage to the entire waste management chain: in some cases, all stages of municipal solid waste management—from door-to-door collection, transfer of MSW to landfill sites or processing facilities—were the responsibility of one waste company, leaving the waste workers

578 Ibid., 250-52.
579 Ibid., 255.
580 Chaturvedi, Arora, and Saluja, "Private Sector and Waste Management in Delhi: A Political Economy Perspective".
581 Somvanshi, "The Economy and Politics of Solid Waste in Delhi. A Rotten Deal for Ragpickers", 66; Municipal Corporation of Delhi (MCD), "Draft Concession Agreement. Door to Door Collection, Transfer, Transportation, Developing an Integrated Municipal Solid Waste Processing Facility and Engineered Sanitary Landfill Facility as Per Msw (M&H) Rules 2000, for Select Zones in Delhi, on a Long-Term Build, Operate and Transfer (Bot) Basis for Municipal Solid Waste", (Department of Environment Management Services (D.E.M.S.), Municipal Corporation of Delhi, 2008), 3–4; Ministry of Urban Development, *Standing Committee on Urban Development (2008-2009). Fourteenth Lok Sabha. Solid Waste Management. Thirty-Eighth Report*; Government of NCT of Delhi, *Urban Development* (New Delhi: Government of NCT of Delhi, 2017) 131.
582 Ministry of Urban Development, *Standing Committee on Urban Development (2008-2009). Fourteenth Lok Sabha. Solid Waste Management. Thirty-Eighth Report*, 56.
583 Sethi, "Waste and Wealth".

in that area without access to waste.[584] This plan underlined the diversion to the formal sector even more, as the waste workers had even less access to MSW, faced a greater threat of losing their livelihood and worse working conditions as they slid into an illegal category. The door-to-door collection by formal companies was yet another symptom of the transformation of disconnecting the informal and the formal system from each other and overlooking opportunities of synergies by connecting both the systems with each other. While firms were supposed to take over the part informal waste workers played, namely segregate the collected MSW, the reality on the ground turned out quite the opposite:

> A look into the detailed project reports (DPRs) and contract agreements signed by the concessionaire (private party) and the municipality exposes the fact that segregation of waste is limited to documents only. The concessionaire is responsible for door-to-door collection, but takes mixed waste from houses as it increases the tipping fee/tonne of waste. As per an official of the NDMC, segregation of waste reduces the tipping fee given by the municipality to the concessionaire.[585]

With the then-chief minister Sheila Dikshit expressing that "[t]he ever increasing garbage and solid wastes have become a huge problem (…) [and Delhi residents needing] to change (…) [their] lifestyles and (…) not to generate unnecessary wastes"[586] added to the pressure of finding suitable MSMW solutions for Delhi. During this period, in which the public sector started to heavily rely on formal private sector involvement, there is only very little evidence in the city of an inclusive approach which is supported by the public sector: in 2011, the NDMC had introduced a scheme in which waste workers got included in the service of DTDC.[587] However, the reach of private firms to households has continued since then, with the MoUD floating requests for proposals under the *Swachh Bharat* Mission umbrella in 2015, inviting bidders in a PPP mode to "(…) design, operate & maintain the system for MSW door-to-door collection and transportation (…)."[588]

5.2.3. The Introduction of the 'Cradle-to-Grave' Approach: Waste-to-Energy Plants as a Cure-All to Delhi's MSW Problems?

In the third phase, which started in practice in 2012 and was discussed in theory almost a decade before that, the focus was on the diversion of waste from landfills to WtE plants. For

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584 Schindler, Demaria, and Pandit, "Delhi's Waste Conflict".
585 Singh Sambyal, "Delhi's Solid Waste: As Systemic Failure".
586 "Solid Wastes, Garbages a Huge Problem for Delhi: Dikshit", *DNA India*, April 9, 2010, https://www.dnaindia.com/india/report-solid-wastes-garbages-a-huge-problem-for-delhi-dikshit-1369406 (last accessed May 3, 2019).
587 Chintan, *Failing the Grade. How Cities across India Are Breaking the Rules, Ignoring the Informal Recycling Sector and Unable to Make the Grade* (Chintan Environmental Research and Action Group, 2011) 25.
588 Ministry of Urban Development, "Request for Proposal for Selection of Operator for Door to Door Collection and Transportation of Municipal Solid Waste Upto Secondary Collection Point", (New Delhi: Government of India, 2015).

the construction and implementation of these projects, Delhi's municipalities had yet again only considered large private sector companies to deliver the required services in a PPP framework. Thus, the eligibility criteria mentioned in the municipal waste management contracts excluded smaller entrepreneurs.[589] In order for the WtE plants to achieve the desired results, the plants require a supply of high calorific value material. The plants are therefore in a direct conflict with recycling as they compete for similar material, namely plastics, paper and cardboard, which eventually had and has further implications for access to recyclable material for the informal waste workers. Till date, Delhi's municipalities consider WtE plants to be one-stop-shop solutions, as municipalities are seemingly able to make the MSW disappear from the public eye and have a single contact point to address and manage, not considering the role of the informal waste workers in the MSWM economy. Delhi's government has given permission to three WtE plants, the Timarpur–Okhla WtE plant, which is supposed to process 2,050 tonnes per day, the Ghazipur WtE plant, which is supposed to process 1,300 tonnes per day, and the Narela–Bawana WtE plant, which is supposed to process 4,000 tonnes per day.[590] By 2016, two of the three WtE plants are running—Okhla and Ghazipur. The MCD and NDMC pay the private firms a tipping fee of rupees 500 to 1,000 for each incinerated tonne of MSW.

The WtE plant in Okhla, which has been backed by the Delhi government and then-chief minister Sheila Dikshit, who hailed this technology as the solution to two of Delhi's major issues—excess waste and shortage of power—had been debated intensely even before it started running in 2012.[591] According to official sources, the "(…) incineration plant (…) is processing 2,000 TPD and generating 16MW. (…) The project is the first and largest integrated waste management project ever being set up in the country."[592] However, the plant's processing capacity has been below the original processing capacity throughout. The reasons for this are manifold, ranging from technical to financial problems: as mentioned before, Delhi's MSW is high in organic material and high in inert content, which leads to the low calorific value of the waste. For energy generation through incineration though, a minimum calorific value is required, otherwise the waste is unfit for burning. Between 2011 and 2015, an average of 69 per cent of the incoming waste at the Jindal waste-to-energy plant was

589 Chaturvedi and Gidwani, "The Right to Waste: Informal Sector Recyclers and Struggles for Social Justice in Post-Reform Urban India", 137.
590 Gupta and Arora, "A Study on Management of Municipal Solid Waste in Delhi", 136.
591 Sruthijith KK, "Jindal Group's Upcoming Waste-to-Energy Plant Has Delhi Fuming", *The Economic Times*, October 7, 2011, https://economictimes.indiatimes.com/industry/energy/power/jindal-groups-upcoming-waste-to-energy-plant-has-delhi-fuming/articleshow/10251773.cms (last accessed April 10, 2019).
592 Swachh Bharat Urban, "Waste to Energy Plant at Okhla, Delhi", Swachh Bharat Urban, http://swachhbharaturban.gov.in/writereaddata/Okhla_Delhi_waste.pdf (last accessed April 10, 2019).

biodegradable waste, and only 30 per cent was waste with high calorific value. For this and other reasons, the Jindal WtE plant continues to face political and judicial opposition: resident associations and environmental activists continue to oppose the WtE plant processing on the basis of the ongoing pollution caused, while unions and NGOs of informal workers continue to advocate for a more elaborate recycling system for MSW instead of focusing on MSW incineration. Residents living close to the Jindal WtE plants in particular continue a conflicted relationship with the municipality, arguing that the emissions of the WtE plant have negative health impacts on them.[593] In July 2015, the Delhi Pollution Control Committee (DPCC) and CPCB shut down the Okhla WtE due to ash fall and for violating the Air (Prevention and Control of Pollution) Act.[594]

In the same year, the Jindal plant opened, the trifurcation of the MCD took place, a step which was welcomed by Sheila Dikshit who said that "[t]he MCD was inefficient and corrupt, as was proved by the accumulation of garbage across the city, she added."[595] This statement underlines that the MSWM situation in Delhi was seen more as a management challenge than an issue related to environmental protection, public health and urban planning. In a way, when considering Delhi's waste scenario as a sole management issue, focussing on technical solutions for Delhi's waste management challenge was a coherent step by the Delhi government, which resulted in the opening of yet another WtE plant in Ghazipur in 2016.[596] The second waste-to-energy plant, which was commissioned after a four-year delay due to the first contracted company quitting midway into the construction, is operated by IL&FS Environmental Infrastructure and Services Ltd., based on RDF technology and which is supposed to process 1,300 MT a day.[597]

The use of this technology in the Indian context however remains controversial among environmentalists, NGOs, scholars, citizens and some parts of the public sector, as the focus on WtE plants and therefore end-of-pipe solutions continue to lead to huge environmental, health, social and structural ripple effects. The environmental concerns related to the viability of WtE plants include the emission of dioxins and furans which are being released during

593 Schindler, Demaria, and Pandit, "Delhi's Waste Conflict", 18.
594 Basu, "Okhla Waste to Energy Plant Put on Notice for Excess Emissions"; Kundan Pandey, "Okhla Waste-to-Energy Plant Will Be Closed, Assures Arvind Kejriwal", ibid., https://www.downtoearth.org.in/news/okhla-wastetoenergy-plant-will-be-closed-assures-arvind-kejriwal-48746 (last accessed April 10, 2019).
595 "'MCD Trifurcation Will Benefit Delhi'".
596 Schindler, Demaria, and Pandit, "Delhi's Waste Conflict", 18.
597 Toxics Link, "National Conference on Waste to Energy" (paper presented at the National Conference on Waste to Energy, New Delhi, 2015); Sweta Goswami, "Delhi's Second Waste to Energy Plant to Start at Ghazipur This Month", *Hindustan Times*, October 10, 2016, https://www.hindustantimes.com/delhi-news/delhi-s-second-waste-to-energy-plant-to-start-at-ghazipur-this-month/story-qR3KeKk8ItZyAIgG0hvV2N.html (last accessed April 10, 2019).

the incineration process, and the lack of monitoring the existing standards of the same which contribute to Delhi's air pollution.[598] Leachate generation through the process is another environmental issue. Health is another factor of concern and one that is often debated in relation to Delhi's WtE plants. Residents in the vicinity of the Okhla plant, for instance, complain about different health problems including headache and breathlessness.[599] The structural and technological concerns of Delhi's WtE plants are related to the mismatch between MSW characteristics and plant design. The incoming waste has a low calorific value which reduces the energy recovery levels, as is the case in the Jindal plant in Okhla. The inadequate MSW collection system in the city and the lack of planning and inter-institutional coordination add to this concern. The reduced energy recovery level of the Okhla plant, for instance, raises questions in relation to the sustainability of the plants as they are less financially viable than expected.[600] In an advisory on MSW services which was published by the MoUD in 2013, the ministry clearly outlines India's WtE scenario, and the environmental and economic impacts of this technology when operated improperly:

> Improperly operated incineration plants cause air pollution. Burning garbage is not a clean process as it produces tonnes of toxic ash and pollutes the air and water.
>
> Cost of incinerator and additional investment on pollution control devices make the process capital-intensive. Under Indian conditions large scale incineration plants are economically non-viable in view of their capital-intensive character and the low calorific value of city garbage available.[601]

The social concerns of Delhi's WtE plants predominately revolve around the labour conditions of waste workers. Within one year of commissioning the Okhla plant, the labour conditions of all categories of waste workers had deteriorated to the extent that their incomes had decreased by 21 per cent.[602] The social impacts on the waste workers' access to waste are immense and increase the uncertainty of their livelihoods. There are several reasons why access of waste workers to waste and recyclables is reduced: first, as high value recyclables

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[598] de Bercegol, Cavé, and Nguyen Thai Huyen, "Informal Recycling Vs Municipal Waste Service in Asian Cities: Opposition or Integration to Municipal Service?", 8.

[599] Global Alliance for Incinerator Alternatives, "Hundreds Call for UNFCCC to End Support for Okhla Incinerator in Delhi", http://www.no-burn.org/hundreds-call-for-unfccc-to-end-support-for-okhla-incinerator-in-delhi/ (last accessed April 10, 2019); Soma Basu, "Okhla Waste to Energy Plant Is Spewing Lead, Other Toxins into Air, Say Residents", *Down to Earth*, July 4, 2015, https://www.downtoearth.org.in/news/okhla-waste-to-energy-plant-is-spewing-lead-other-toxins-into-air-say-residents--40901 (last accessed April 9, 2019); Basu, "Okhla Waste to Energy Plant Put on Notice for Excess Emissions"; Moyna, "Okhla Waste-to-Energy Plant Safe: Jayanthi Natarajan", ibid., https://www.downtoearth.org.in/news/okhla-wastetoenergy-plant-safe-jayanthi-natarajan-37805 (last accessed April 10, 2019); Kundan Pandey, "Okhla Waste-to-Energy Plant Will Be Closed, Assures Arvind Kejriwal", ibid., https://www.downtoearth.org.in/news/okhla-wastetoenergy-plant-will-be-closed-assures-arvind-kejriwal-48746 (last accessed).

[600] Link, "National Conference on Waste to Energy".

[601] Ministry of Urban Development, *Advisory on Improving Municipal Solid Waste Management Services*, 14.

[602] Chintan, *Give Back Our Waste. What the Okhla Waste-to-Energy Plant Has Done to Local Wastepickers* (New Delhi: Chintan Environmental Research and Action Group, 2012) 12.

such as plastics and paper are a requirement in the WtE plants, the waste workers continue to compete with private firms for valuable material. Second, the MSW is either collected from the source or directly transported from the transfer station to the WtE plant, which leaves out door-to-door collection for the waste workers, as well as the landfill site as their possible access to valuables. "Delinking the formal and informal systems and construction waste-to-energy plants not only threatens the livelihoods of waste workers but also reduces the percentage of waste that is recycled (and most likely result in increased toxic emission and ash)."[603]

When applying the waste hierarchy logic to MSW treatment in Delhi, it is clear that WtE plants are conflicting with recycling as they compete for similar material, namely plastics, paper and cardboard. Moreover, recycling reduces emissions twenty-five times more than incineration does.[604]

All these rationales about WtE technologies and their implementation and impacts in India become even more pressing when one sees that selective aspects of nowadays knowledge has been in existence for almost twenty years. The 1999 report of the committee constituted by the Supreme Court of India states:

> Nowadays, several technologies are being advocated by private entrepreneurs for the processing, treatment and/or disposal of municipal solid waste. Some have Indian experience such as microbial composting, vermi composting, whereas some are based on applications in foreign countries which are yet to be tried successfully or have failed in India, such as incineration, power generation and fuel pelletisation. Several local bodies have made MOUs and agreements with such firms for setting up plants, with or without the support of government. (…)
>
> Most local bodies lack the competence to assess the suitability of technology which may work under Indian conditions with the type of wastes produced in Indian cities. Quite often, local bodies are carried away by technology utilized in developed countries without evaluating its applicability under Indian conditions and therefore meet failure later. Much valuable time and money is wasted in such experimentation by local bodies.
>
> It is therefore necessary that before adopting a new technology proposed by those having no Indian experience, particularly in the areas of power generation, fuel pelletisation or incineration of ordinary municipal solid waste and where no plant has come up successfully in India, local bodies must carefully look into various options available and choose a technology for the processing of wastes which suits the local conditions.[605]

This quote by a municipal representative in 2016 not only stands in stark contrast to this 1999 rationale, it also raises questions as to how far existing knowledge is being applied:

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603 Schindler, Demaria, and Pandit, "Delhi's Waste Conflict", 19.
604 Somvanshi, "The Economy and Politics of Solid Waste in Delhi. A Rotten Deal for Ragpickers".
605 Supreme Court of India, *Solid Waste Management in Class 1 Cities in India. Report of the Committee Constituted by the Hon. Supreme Court of India.*

"Waste-to-Energy is for us an ideal tool to bypass our constraint of space for new landfills and, we hope, to generate at the same time valuable revenue out of waste (…)."[606]

5.2.4. Delhi's Current MSWM Approach (2016 and beyond)

The current approaches for Delhi's MSWM can be divided into two broad categories: centralised and decentralised MSWM. The centralised approach is driven by the inability of the ULBs to manage the growing amounts of MSW in an effective manner because of a lack of capacity. As a result, the ULBs search for quick solutions and the involvement with the formal private sector appears to be a cure-all solution. Therefore, the focus of ULBs has shifted to the development of large infrastructures and treatment facilities, and the setting up of WtE plants through large formal waste management firms. The aim of this approach, which is backed by the national government is twofold: while one aspect is related to the idea of making wealth out of waste, as the "(…) the government is motivated by the economics of waste (…)"[607], the other objective is to cover for the continuous shortage of power in Delhi.[608]

However, as outlined earlier, both these aims are jeopardised, since (i) the financial viability of the Jindal plant in Okhla is at least doubtful, and (ii) Delhi's WtE plans are not able to manage and cover the electricity demand of Delhi.[609]

> There is a shared interest and opportunity-based alliance between these local governments and large waste management companies who can obtain large value contracts for providing city-wide waste management services. The promise of a clean city, generating energy from waste and reducing the administrative and financial burden of the local government provides the necessary support for the alliance between the city government and the formal waste management companies. Civil society and citizen groups play a critical watchdog role in this approach but have limited active engagement in waste management. The widespread informal sector is seen as a competitor for the formal waste management agencies because it competes with the formal private sector actors for access to waste.[610]

The centralised system seemingly guarantees a single-point responsibility of managing the entire MSWM chain by a single operator and is therefore an appealing solution for Delhi's ULBs, which continue to bank on contracting private companies for MSWM. In the beginning of 2017, the North Delhi Municipal Corporation launched India's largest and Delhi's

606 de Bercegol, Cavé, and Nguyen Thai Huyen, "Waste Municipal Service and Informal Recycling Sector in Fast-Growing Asian Cities: Co-Existence, Opposition or Integration?", 4.
607 NGO representative, New Delhi, May 20, 2017.
608 Chaturvedi, Arora, and Saluja, "Private Sector and Waste Management in Delhi: A Political Economy Perspective".
609 Public sector representative, New Delhi, February 11, 2016.
610 Chaturvedi, Arora, and Saluja, "Private Sector and Waste Management in Delhi: A Political Economy Perspective".

third WtE plant at Narela-Bawana,[611] and by mid-2018 that same municipality started the construction of Delhi's fourth WtE plant at Bhalswa.[612] Considering "[w]aste to Energy (…) [being] the most eco friendly method of disposal of MSW"[613]— a statement made in India's Supreme Court proceedings in 2018—is just another piece of the jigsaw completing the picture of MSWM centralisation through privatisation.

Delhi's decentralised MSWM approach is, like the centralised approach, driven by the inability of ULBs to manage MSW in an effective manner. The focus of the decentralised approach however is on the enhanced involvement of the community in waste management processes. As such, the distributed community level initiatives are only implementable through enhanced community participation. The development of decentralised MSWM facilities—such as composting facilities or material recovery facilities and involving existing actors like the informal waste workers—forms the basis of the decentralised approach. The objective of this approach is to reduce the dependence on the ULBs, and at the same time create citizen awareness and therefore enhance community engagement. The involvement of the informal waste workers in this approach is another objective which aims at sustaining the waste workers' livelihoods. While the centralised approach is mainly backed by the national government and the ULBs, the decentralised approach is driven by civil society actors, NGOs, citizens and representatives of the informal waste workers' organisations. While the decentralisation process aims at being less dependent on the local government, the close cooperation with the ULBs, is key in order to establish decentralised MSWM infrastructure and get the informal waste workers involved in a sustainable manner.

Over the past couple of years, the number of decentralised MSWM solutions in Delhi has increased. The modus operandi among the existing decentralised facilities varies significantly, with some colonies hiring a private company to deal with their waste and other colonies getting residents to do it themselves. For example, the Zero Waste Project, started at New Moti Bagh in 2013, is run by Green Planet Waste Management Pvt. Ltd. Over 1,000 families residing in the 110-acre complex, produce 900 kilograms of horticultural waste and 700 kilograms of kitchen waste every day. This waste, along with all other household waste, is

611 Vibha Sharma, "India's Largest Solid Waste-to-Energy Plant Launched at Delhi's at Narela", *Hindustan Times*, March 17, 2017, https://www.hindustantimes.com/delhi-news/municipal-corporation-inaugurates-india-s-largest-solid-waste-to-energy-plant-at-narela/story-dZuZaGLV3UFQPzU8vmSbyM.html (last accessed April 10, 2019).
612 Vibha Sharma, "North Delhi Municipal Corporation to Start Work on Waste-to-Energy Plant at Bhalswa by August End", *Hindustan Times*, August 1, 2018, https://www.hindustantimes.com/delhi-news/north-delhi-municipal-corporation-to-start-work-on-waste-to-energy-plant-at-bhalswa-by-august-end/story-4wu3t3arz0kqsMQr6n42eP.html (last accessed April 10, 2019).
613 Supreme Court of India, *Record of Proceedings. Writ Petition(S) (Civil) No(S). 202/1995*.

collected and brought to the segregation site, from where the organic waste is treated in a composting plant to produce organic fertiliser. The horticultural waste is treated in a pellet making plant to produce biomass pellets, and the plastic waste is processed to produce fuel. All other recyclable waste is being sent to the respective recycling infrastructure.[614] Defence Colony is an example of residents' involvement in setting up the pit composting facility. Toxics Link, together with Defence Colony's RWA, created the concept of this compost facility, which was already set up by 2005 in an unused space of the colony. Two waste workers have been trained by the RWA, who work at this compost facility and generate their income from there.[615] While the aim of both these examples is the same, namely, having a functioning decentralised MSWM facility in place, the implementation, also in terms of set-up and running costs, differs significantly: the private company required ₹ 4,000 per household to set up the plant, which amounts to eight million rupees, while setting up the Defence Colony compost plant cost ₹ 45 per household, amounting to an overall cost of ₹ 7,000.

The SWM Rules, 2016, emphasise the need for decentralised solid waste management facilities to be included and established "(…) in the development plan for group housing or commercial, institutional or any other non-residential complex exceeding 200 dwelling or having a plot area exceeding 5,000 square meters (…)"[616], but also further underlining that "(…) [p]reference shall be given to decentralised processing to minimize transportation cost and environmental impacts such as (…)."[617] These rules therefore indeed stress on the importance of decentralisation, but at the same time they highlight the need for the centralised approach. The centralised structures have been established for many years and these infrastructures have strengthened throughout the past years. The government seems to underestimate that "decentralisation requires a systematic change"[618], which will not only take time, but requires all involved stakeholders to be on the same page and cooperate.

5.3. Objectives and Priorities of Delhi's MSWM Stakeholders

Delhi's MSWM scenario has undergone various transitions in the past two decades. The previously discussed scenario in Delhi's MSWM economy outline how the objectives and priorities of involved stakeholders developed and partly altered during the years. More often

614 Green Planet Waste Management Pvt. Ltd, "Green Planet Waste Management Pvt. Ltd", Green Planet Waste Management Pvt. Ltd, http://gpwm.strikingly.com (last accessed April 10, 2019); Satwik Mudgal, "Make Wealth from Waste", *Down to Earth*, August 17, 2015, https://www.downtoearth.org.in/coverage/waste/make-wealth-from-waste-47164 (last accessed April 10, 2019).
615 Mudgal, "Make Wealth from Waste".
616 Ministry of Environment, "Solid Waste Management Rules, 2016", 11 (h).
617 Ibid., 15v.
618 NGO representative, New Delhi, May 20, 2017.

than not, key actors behind solid waste management are not primarily concerned with environmental, health or urban planning related issues, as most actors have priorities other than sustainable solid waste management. While the objectives of Delhi's MSWM actors might be same, priorities might be different. In order to identify possible interfaces between stakeholders and therefore chances to cooperate, it is important to understand the several objectives and their alignment, as well as how each actor prioritises their objectives.

Based on the in-depth analysis of Delhi's MSWM economy as well as information distilled from interviews with the respective stakeholder groups, Table 14 presents the outcomes of identifying stakeholders' objectives and outlines the limitations in forging alliances between the involved stakeholders, as few objectives and their prioritisation overlap. The protection of public health and the environment have been and continue to be core concerns and interests of Delhi's citizens. These concerns are backed by civil society organisations and environmental NGOs. The close collaboration and partnerships between NGOs and some RWAs have been key in pushing forward sustainable waste management solutions, such as decentralised colony composting. While the ULBs are interested in protection of the environment as well as public health, their priority lies in the cleanliness of the city. This is an overlapping interest among the ULBs and the citizens, which the local and national governments try to emphasise—for example, in the *Swachh Bharat Abhiyan* and its campaigns related to solid waste when aiming at citizen involvement. Thus, the NDMC and the DCB made it a mission to act upon *Swachh Bharat Abhiyan's* vision, by implementing door-to-door collection and sensitising residents for more participation less than one year after the initiative's launch.[619]

The resource value of waste is the common interest of formal waste management companies and informal waste workers. However, since this interest is based on another shared objective, namely access to waste, for which both the actors compete, an alliance among these two is challenging. A waste worker's key priority is livelihood and jobs. This objective is shared with some of Delhi's NGOs that work mainly for preserving the jobs of MSW waste workers. The three priorities of informal waste workers, namely jobs, access to waste, and the resource value of waste, are closely interlinked with the formal waste management companies, as their key objective is the resource value of waste and access to waste. Without the ULBs having a significant interest in preserving jobs for the waste workers, the competition for the waste itself remains a conflicting aspect.

[619] Risha Chitlangia, "NDMC Success: Door-to-Door Collection Key", *The Times of India*, August 9, 2015, https://timesofindia.indiatimes.com/city/delhi/NDMC-success-Door-to-door-collection-key/articleshow/48407917.cms (last accessed May 3, 2019).

> Local governments need to forge alliances between those with divergent objectives and priorities, such as the informal sector, the formal private sector, and civil society/NGO groups. A broad understanding of local politics, policies, actors and interests is essential before any policies are proposed and reforms attempted by the local government. Contrary to the recommendations of most government policy documents (especially in India), raising awareness and finding private sector suppliers of appropriate technologies should not be the only focus of local government responsible for waste management.[620]

Table 14: Delhi's MSWM actor objective matrix

Actor objectives	ULBs	Waste management companies	Informal waste workers	Civil society organisations & environmental NGO's	Citizens
Health	✓			✓	✓
Environment	✓			✓	✓
Resource value of waste		✓	✓		
Cleanliness	✓				✓
Waste workers jobs			✓	✓	
Access to waste		✓	✓		

Source: Author's own, based on Chaturvedi, Vijaykalakshmi, and Nijhawan (2015), 13–16.

When objectively considering the alignments of Delhi's stakeholders' prioritised objectives, as outlined in Table 15, every stakeholder has a minimum of one overlapping priority interest with another stakeholder, which, theoretically, in an ideal scenario, should be tenable. However, it also becomes clear that two driving and impactful forces in the MSWM transformations in Delhi, namely the ULBs and the formal waste management companies, each only have one overlapping priority with another stakeholder: the ULBs main priority is the cleanliness of the city, so is this same interest a key priority of the citizens. However, as mentioned earlier, while several awareness building and participatory aspects have been introduced in Delhi's context, the MSW situation has not improved substantially. The only overlapping interest of the waste management companies is access to waste, which is an interest they share with informal waste workers. The competition between informal waste workers and the formal waste companies over access to waste is a clear hindrance in forming meaningful partnerships. And yet, this is exactly what would be required in order for Delhi's MSWM system and the related scenario to substantially change: once the ULBs prioritise a common interest with the waste workers—such as preserving their livelihood— or formal waste

[620] Emilie Wilson, "Managing the Emerging Waste Crisis in Developing Countries' Large Cities", *IDS Policy Briefing*, no. 86 (2015): 4.

companies would prioritise their concerns—such as the protection of the environment or the resource value of waste (which would inherently underline a lifecycle approach and the circular economy understanding), then the nature of partnerships and cooperation among the involved stakeholders could change.

Table 15: Overlapping priorities of Delhi's MSWM stakeholders

	ULBs	**Companies**	**Waste Workers**	**NGOs**	**Citizens**
ULBs					✓ Cleanliness
Companies			✓ Access to waste		
Waste Workers		✓ Access to waste		✓ Waste workers' livelihoods	
NGOs			✓ Waste workers' livelihoods		✓ Health & Environment
Citizens	✓ Cleanliness			✓ Health & Environment	

Source: Author's own, based on Chaturvedi, Vijaykalakshmi, and Nijhawan (2015), 13–16.

5.4. Discussion and Summary

Over many years, developments in the institutionalised frame have increased the competition for access to waste between the informal and formal actors in Delhi, which has laid the ground for a conflicted relationship between all stakeholders involved, especially the formal and informal private actors The potential social, environmental and economic gains for involved actors that would result from synergies and collaborations also between the waste workers and firms, have been undermined or not taken into consideration by the national and local governments so far.

The SWM Rules, 2016, are going into finer details of almost every stage involved in waste management, be it segregation at source, transportation of waste, or treatment and final disposal. The functions of relevant stakeholders have been outlined and the contribution of informal waste workers has been recognised. While these rules are a sign of the first step in the direction of a more inclusive approach and indicate an understanding on the part of the

government that the informal sector plays a very essential role in the landscape of India's waste management economy, the government of Delhi does not see the urgent and inalienable need for measures and policies which aim for better working and living conditions for waste workers. As a matter of fact, the government of Delhi focuses more on the formal economy of the city than on the informal economy. The Master Plan for Delhi 2021 displays quite clearly what the city's government is aiming at: the government of the city formulates the vision of Delhi as "(…) a global metropolis and a world-class city (…)."[621] The public sector in Delhi faces challenges and hindrances while implementing an integrated waste management system, such as difficulties in investing in and maintaining facilities, ongoing absence of sustainable financing sources, and a lack of capacities among local governments.[622] It is this lack of capacities of the national and Delhi's ULBs that lead to the search for quick solutions, which the ULBs seem to find in the involvement of the formal private companies in Delhi's MSWM. "They see private sector involvement in waste management as a cure-all"[623], which is solely based on the capital-intensive approach of implementing advanced technologies in order to deal with Delhi's MSW scenario, which by now is mainly considered a management challenge. This centralised, top-down approach does not distinguish between Delhi's varied needs and leaves little space for community participation or the involvement of Delhi's informal waste workers. The involvement of private waste companies in Delhi, getting paid according to the amount of waste either disposed in the landfill or incinerated in one of the two WtE plants, started a whole new dynamic with substantial impacts and consequences for Delhi's recycling economy and the involved waste workers.

> As public service is outsourced to private contractors, the contractor's desire to maximize profit diverges from the government's desire to safeguard public health, a common phenomenon that scholars call goal divergence. Rather than motivating contractors to fulfill the government's objective, the profit motive leads contractors to work against it. In the case of MSWM, contracts commonly pay contractors according to the tons of waste collected, hauled and dumped, thereby creating a powerful, direct financial incentive to *maximize,* rather than minimize waste.[624]

The process of Delhi's privatisation neglects the fact that this informal economy's expertise in collection, segregation and dismantling, and the formal sector's expertise in advanced technological solutions, could result in cooperative models which would reinforce the potential

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[621] Delhi Development Authority (DDA), *Master Plan for Delhi - 2021*, iv.
[622] Dukhan, Bourbon-Séclet, and Yannic, "Linking Public and Private Action for Sustainable Waste Management", 9.
[623] Chaturvedi, Arora, and Saluja, "Private Sector and Waste Management in Delhi: A Political Economy Perspective", 9.
[624] Anderson, "Privatisation: A Formula for Provision or Perversion of Municipal Solid Waste Management", 21.

of both the sectors, the formal and the informal. The system fails to see "(…) that the experience and knowledge and efficiency of the informals contribute to the effectiveness and marketing access of the formal system. (…) this kind of hybrid 'integration' approach has significant economic and social benefits."[625] It is these waste workers who provide essential work to the city of Delhi as they form the very base of daily waste collection, segregation and dismantling. Delhi's official waste management system would not be able to manage the generated waste. Nevertheless, the effectiveness of the waste workers is, even though recognised, not duly acknowledged by the government, as most of the state-led interventions in the solid waste management system run parallel to the work of the informal sector. This increases the competition for access to waste between the informal and formal sector, and therefore poses a threat to the livelihood of waste workers. These conflicting dynamics among Delhi's private sector actors and the public sector paved the way for a number of environmental NGOs, such as Toxics Link, to step in and create awareness in regard to environmental damages due to the ill-managed solid waste management system in Delhi. Moreover, numerous NGOs, such as Chintan Environmental Research and Action Group, address social justice concerns of the waste workers in an integrated manner, advocating rights and organising the activities of these informal waste professionals.

Delhi's MSWM system in 2016 can be characterised by a lack of compliance with the SWM Rules, 2016, and a variety of hindrances along the waste management chain: first, the non-availability of infrastructure for segregation is one of the biggest challenges, as the segregation of waste is a crucial prerequisite for any sort of processing and treatment afterwards. In this regard, sixty-one-year-old community member Chitra points out: "We do not segregate waste at home due to insufficient space for the needed bins", and fifty-eight-year-old Chand states: "The municipality should provide the adequate infrastructure and equipment, like coloured green, blue and red plastic bags otherwise segregation becomes very difficult."[626] While some RWAs provide the required infrastructure for source segregation, Delhi's population living in unauthorised areas, which amounts to 50 per cent[627] of the city, almost entirely lacks any sort of waste management. The existing contracts with formal private waste management companies incentivise dumping of MSW, which increases the already grim status of Delhi's landfills. In addition, the MSW which gets processed is more often than not inadequately processed, which creates an entirely new environmental and health

[625] Gunsilius, Spies, García-Cortes et al., *Recovering Resources, Creating Opportunities: Integrating the Informal Sector into Solid Waste Management*, 7.
[626] Chand, fifty-eight, South Extension II, May 5, 2017.
[627] UN-Habitat, *Solid Waste Management in the World's Cities*, 59.

related chain reaction. Finally, the participation of informal waste workers in the overall MSW economy is not optimised.[628]

The privatisation of Delhi's MSWM services in the past decades has had various adverse impacts on Delhi's informal waste workers. The informal waste workers effectively doubly subsidise the formal sector, as the waste workers on the one hand decrease the amount of MSW which needs to be managed by the formal waste companies, and on the other hand, pay money to municipalities to be allowed to work in their own area (see Box 12).[629] With no proper permits or legal status, waste workers often face occupational hazards and police harassment, while at the same time having to fight for access to waste. Moreover, being socially stigmatised (see Box 11), informal workers at risk of becoming dependent on powerful collaborators.[630] Considering this status of Delhi's informal waste workers, the aforementioned comment of a public sector representative who claimed that "[t]here is no issue with the informal sector"[631] is interesting. "While on the other hand certain local governments have engaged and worked closely with informal sector actors, other[s] have either chosen to ignore them or actively worked against them in favour of large private companies (…)."[632]

Box 12: Interlinkage between the informal and the formal MSW economy in Delhi

The interview with an informal waste worker revealed the existence of a subsidy system among the informal and formal waste workers. While only one interviewee openly explained the structure of this system, other interviewees hinted at such structures, but did not go into any further details. For reasons of anonymity, the following scenario is concealed: a formal waste worker used to be an informal waste worker. As an informal waste worker, he collected waste in an area A. As an employee of the municipality, he became responsible for area B. Having worked as an informal waste collector in area A for almost ten years, for financial reasons, the now formally employed waste worker did not want to leave area A behind. In order to remain involved in the MSW collection in area A, he allocated one of the known other informal waste workers (in this case the interviewee) to collect MSW from households in area A. Instead of leaving the responsibility for MSW collection in area A entirely to the informal waste worker, the now formal waste worker

[628] NGO representative, New Delhi, May 20, 2017.
[629] Asma Majeed, Syeda Adila Batool, and Muhammad Nawaz Chaudhry, "Informal Waste Management in the Developing World: Economic Contribution through Integration with the Formal Sector", *Waste and Biomass Valorization* 8, no. 3 (2017).
[630] Chaturvedi, Arora, and Kilguss, "E-Waste Recycling in India–Bridging the Formal–Informal Divide", 213.
[631] Public sector representative, New Delhi, September 30, 2016.
[632] Chaturvedi, Vijayalakshmi, and Nijhawan, *Scenarios of Waste and Resource Management: For Cities in India and Elsewhere*, 10.

till date continues to collect a monthly fee of ₹3000 as an offset. The informal waste worker, who now collects MSW in area A, effectively subsidises the monthly salary of the formal waste worker.

Source: Author's own.

This discrepancy in how to involve and integrate informal waste workers into Delhi's MSWM economy shows that there is a need for regulatory mechanisms, so that informal waste workers are not only recognised for their activities and contribution, but also considered a part of the private sector. Policy makers need to bring waste workers into the policy framework and must legalise their activities so that partnerships among other stakeholders and informal waste workers can be taken out of the legal grey zone. While the legalisation of waste workers and their activities is often considered to be an essential step to be taken at the national level, some scholars claim that this step could also pose its own set of challenges as legal government recognition would eventually lead to a loss of the waste workers' flexibility in working standards.[633] The legal recognition of waste workers goes hand in hand with the integration of waste workers.

> The integration of the informal sector aims to utilise its entrepreneurial abilities to create business models that can be accommodated within present economic paradigms. Moreover, integrating the informal sector workers has the potential to significantly improve their living conditions.[634]

Capacity building and skills development as well as facilitating credit are only a few activities that support the integration of informal waste workers. "Indeed, the state could compensate waste workers for their services (both collection and high recycling rates) by providing them with space, equipment (e.g. bicycles, pushcarts, masks and gloves), and access to healthcare and a pension scheme."[635] The informal waste workers, when organised in microenterprises, cooperatives or PPPs, can become more efficient in their recycling. By getting organised, informal workers can strengthen their bargaining position; they can be a tool for empowerment of Delhi's waste workers, as they are then able to get into contracts with industries directly.[636]

Representatives of social and environmental NGOs in Delhi, as well as scholars and a few actors from the public realm, continue to highlight the need for a structural change along Delhi's MSW management chain. Considering the waste hierarchy logic as the basis for

[633] Sethi, "Waste and Wealth".
[634] Chaturvedi, Arora, and Kilguss, "E-Waste Recycling in India–Bridging the Formal–Informal Divide", 209.
[635] Schindler, Demaria, and Pandit, "Delhi's Waste Conflict", 20.
[636] Medina, "The Informal Recycling Sector in Developing Countries: Organizing Waste Pickers to Enhance Their Impact".

understanding the minimisation of waste generation is key and the very foundation. While reduction of waste also has to take place at the institutional level through instruments such as EPR, the waste generator plays an equally important role. As such, the core responsibility lies with the waste generator. This responsibility expands further when considering mandatory source segregation introduced in 2016. Source segregation is an essential prerequisite for sustainably implementing the waste hierarchy logic, and it requires a tough compliance system. Interviews with waste generators have proven that there is, more often than not, an inherent reluctance to waste segregation and even the fact that the provision of waste management costs. The general assumption is that the waste management costs are included in property tax; however, this tax is seldom computed for this service.[637] Thirty-five-year-old Arjun, for example, states: "We will not accept to pay for services which are not provided regularly. Some weeks the waste picker does not come for three or four days. Why should we pay him?"[638] Thirty-year-old Komal says: "The government eats the money. Until and unless the waste will be picked up in a proper manner I will not pay something extra."[639]

The incentivisation of source segregation or the introduction of a penalty for non-segregation through mechanisms such as 'pay-as-you-throw' or the 'polluter pays principle' are just a few instruments Delhi's ULBs could put in place:

> It is also clear that households must be made to pay for the amount of waste they generate and penalised if the waste is not segregated. It is time we accepted that each household and commercial establishment is a waste generator and so a potential polluter. The principle of polluter pays must be applied. Otherwise our cities will become giant garbage fields.[640]

This kind of waste management fee was introduced by the NDMC in August 2016. While the NDMC area in Delhi only covers 3 per cent of the city's area, it is home to many embassies, hotels and other commercial establishments. The NDMC chairperson underlined that this fee would cover the waste management, which also includes DTDC. While the introduction of the waste management fee is in accordance with the Solid Waste Management Rules, 2016, the residents and officials of the NDMC area did not entirely welcome this move.[641] Segregation at source by the households and waste collection at doorsteps to be undertaken by waste workers can support the integration of informal waste workers into an

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637 Narain, "Garbage Is About Recycling".
638 Arjun, thirty-five, Uday Park, June 2, 2017.
639 Komal, thirty, Dwarka, November 4, 2016.
640 Narain, "Garbage Is About Recycling".
641 Ritam Halder, "Rs 15 to Rs 10,000: Residents in Delhi's Vip Zone Will Pay for Garbage Service", *Hindustan Times*, August 29, 2016, https://www.hindustantimes.com/delhi-news/from-rs-15-to-10-000-ndmc-residents-will-now-pay-for-doorstep-garbage-service/story-o1XRKDrzMMfkThxaBuuwyM.html (last accessed May 3, 2019).

efficient waste management system. As mentioned earlier, much of the discussion is around the involved waste workers and the need for viable working models in the form of working business relationships and contracting mechanisms that incentivise the collaboration between informal and formal actors. "The systems cross each other in every possible way, and are so thoroughly interwoven that any intervention anywhere in the system will affect all parts of it. Solid waste management is not a set of unconnected parts, it is a highly dynamic system with deep connections between parts."[642] Representatives of various environmental NGOs underline the urgent need for Delhi's ULBs to support and facilitate the decentralisation of waste management infrastructure throughout Delhi, as the "(…) installation of decentralized solid waste processing units (…) and development of formal recycling industry sector is the need of the hour (…)."[643]

In addition to this, much of the debate about Delhi's involved stakeholders is that contracts with private waste companies should be on the basis of the quantum of waste processed and recycled. Currently all contracts in Delhi have an incentive to bring larger amounts of MSW to the landfill sites or the WtE plants, as the compensation is against the quantum of MSW collected, disposed or incinerated. This so-called 'tipping fee' essentially means that the larger the quantum of waste brought, the larger the financial compensations. This mechanism should be ideally turned around, so that the contractor pays a tipping fee for the waste disposed or incinerated. Imposing this kind of landfill tax would eventually lead to a scenario in which (i) the recycling and reuse of material would be a viable option; (ii) the amount of MSW that ends up in one of Delhi's landfills reduces; and (iii) the waste processing industries have a chance to be financially viable.[644] Delhi's landfill debate is another complex issue, as all three landfills had already exceeded their capacity in 2008 and are not sanitary landfills. While both actors from the public realm and environment scholars and experts, discuss the need of sanitary landfills in Delhi, another branch of discussion is already a step ahead, by accepting and acknowledging the waste hierarchy in its entirety, when aiming at a zero-landfill future for Delhi and also India. "Ensuring a zero-landfill future has to be the aim of a reinvented waste management system."[645]

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[642] Gunsilius, Spies, García-Cortes et al., *Recovering Resources, Creating Opportunities: Integrating the Informal Sector into Solid Waste Management*, 6-7.
[643] Joshi and Ahmed, "Status and Challenges of Municipal Solid Waste Management in India: A Review", Abstract.
[644] Narain, "Sunita Narain: In Need of a Landfill Tax".
[645] Narain and Singh Sambyal, *Not in My Backyard. Solid Waste Management in Indian Cities*.

6. Conclusion and Outlook

The fundamentals of a sustainable municipal solid waste management system comprise of elements such as the reduction of waste at source, the introduction of separate collection and sorting processes in order to encourage recycling and reuse, the organisation of a regular waste transportation as well as the promotion and implementation of waste-appropriate recycling and recovery technologies.[646] This kind of an integrated system, which is based on reduction, segregation, recycling and recovery, reflects in its essence the order of priorities, which is also reflected in the waste hierarchy concept, with a focus on reduction, reuse, recycling, energy recovery and disposal of waste.[647] Moreover, the core of a functioning MSWM system, as outlined in Figure 9 depends on a structured regulatory framework and public authorities, whose technical and institutional capabilities are well-defined.[648]

> Perhaps more so than for other public utilities, waste management requires coordination among numerous stakeholders at different stages in the process and class for a broad range of skills and know-how. Implementing a proper waste management policy implies a strong involvement from the public authorities in running the service. This includes controlling costs, planning investment, negotiating contracts with service providers, educating users, establishing and enforcing regulations, and involving producers and consumers.[649]

While the public authorities, by laying down the regulatory framework, are at the core of the overall system, all other involved stakeholders circle around the core. The requirement of a holistic approach and the development of sustainable solutions that consider local needs and conditions is key. Addressing all elements of solid waste management while at the same time involving all relevant stakeholders and considering factors surrounding technology,

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646 Dukhan, Bourbon-Séclet, and Yannic, "Linking Public and Private Action for Sustainable Waste Management", 10.
647 Gunsilius, Spies, García-Cortes et al., *Recovering Resources, Creating Opportunities: Integrating the Informal Sector into Solid Waste Management*.
648 Dukhan, Bourbon-Séclet, and Yannic, "Linking Public and Private Action for Sustainable Waste Management", 11.
649 Ibid., 10.

innovation, environment, finance, institutionalisation and social, cultural and economic factors, is the approach of an "integrated sustainable waste management".[650]

Figure 9: Interconnectivity of a functioning MSWM system

Source: Author's own.

By analysing India's municipal solid waste management policies, programmes and guidelines of the past thirty years and Delhi's MSWM stakeholders' dynamics over the past twenty years, this research reveals a very dense and complex network of connectedness and disconnectedness, not only between the stakeholders involved, but also between elements, such as social, cultural and economic factors, which (usually) contribute to the functionality of a municipal solid waste management system. The complexity of India's MSWM situation has caused a sort of MSWM- standstill or "waste paralysis", which is emphasised by the following two quotes from CBCB publications:

> Transportation of garbage is carried out using old outdated trucks, tippers and refuse collectors. Inadequacy of transportation fleet and frequent breakdown of vehicles are the

[650] UN-Habitat, *Solid Waste Management in the World's Cities*; Christian Zurbrügg, Margareth Gfrerer, Henki Ashadi et al., "Determinants of Sustainability in Solid Waste Management–the Gianyar Waste Recovery Project in Indonesia", *Waste management* 32, no. 11 (2012); David C Wilson and Ljiljana Rodic Dipl Ing, "Integrated Sustainable Waste Management in Developing Countries", *Proceedings of the Institution of Civil Engineers* 166, no. 2 (2013); David C. Wilson, Jennifer Bangirana Kanjogera, Reka Soós et al., "Operator Models for Delivering Municipal Solid Waste Management Services in Developing Countries. Part A: The Evidence Base", *Waste Management & Research* 35 (2017); Lilliana Abarca Guerrero, Ger Maas, and William Hogland, "Solid Waste Management Challenges for Cities in Developing Countries", *Waste management* 33, no. 1 (2013); Arnold Van de Klundert and Justine Anschütz, *Integrated Sustainable Waste Management-the Concept* (Waste, 2001); Peter Schübeler, Jürg Christen, and Karl Wehrle, *Conceptual Framework for Municipal Solid Waste Management in Low-Income Countries*, vol. 9 (SKAT (Swiss Center for Development Cooperation) St. Gallen, 1996).

> major hardship in proper collection of garbage. Disposal of municipal solid wastes is generally done through landfilling. Most of the cities have acquired land for landfilling years ago, and now these sites are over-used.[651]

> The fact is that Indian cities and towns are found littered with garbage (MSW) and represent an ugly look at many places within the city/town. In most of the towns/cities, only important locations are maintained cleanliness leaving other places choking with uncollected waste. The collected wastes are disposed on un-attended land-fills; and it is a long-way to see that the entire waste collected by a city or town is processed and only remnants disposed in landfill.[652]

While the above quoted observations underline the criticality of India's MSWM situation, they also emphasise the "waste paralysis" that the country has been in, as the upper quote was made almost twenty years ago, and the lower quote (was made) in 2016. This shows that, although the framework conditions and external circumstances have evolved throughout the past decades, the matter at hand, namely the improper management of MSW, has remained an issue.

6.1. Insights and Limitations

This research concludes that, while India's MSWM regulatory framework has indeed evolved over the past thirty years, the exponential growth in MSW and the varying levels of engagement of all relevant stakeholders increase the urgency and complexity of India's MSWM challenge. "Building toilets is much easier but solid waste management is the real challenge to ensure a clean Urban India by 2019."[653] This statement by the minister of the MoHUA in 2017 underlines that India's public sector actors recognise the seriousness of India's solid waste situation. In an interview with a formal private sector representative of a waste management company, the interviewee, when asked about India's MSWM challenge, stated:

> We are one of the world's leading waste management service providers. We successfully implement waste management solutions around the globe. India is different. We are here since around fifteen years and until now, we haven't found a working solution. We haven't yet found the way how to deal with India's MSW. The number of involved stakeholders makes the overall setting very challenging. You cannot compare India's complexity to the complexity of other countries, it is just very different and therefore we need different tools, which we haven't figured out yet.[654]

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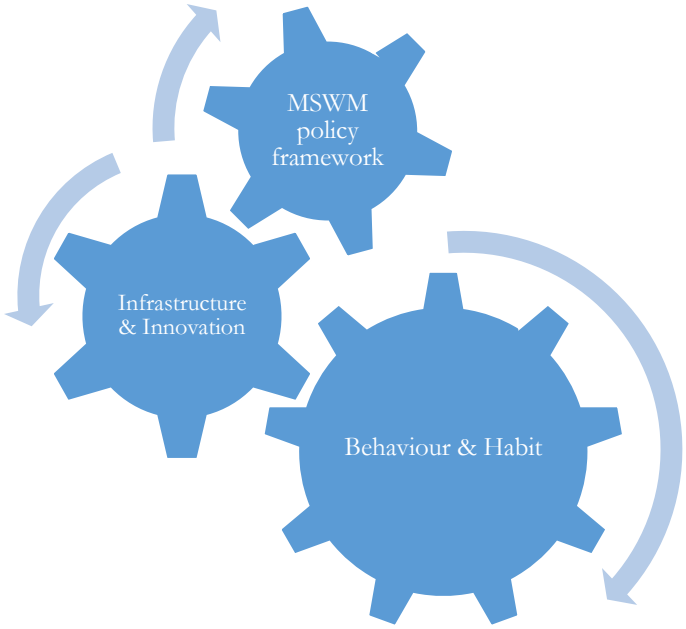
[651] Central Pollution Control Board, *Parivesh. A News Letter Vom Envis Centre.*
[652] Central Pollution Control Board, *The National Action Plan for Municipal Solid Waste Management*, 1.
[653] "Puri Stresses Segregation of Municipal Waste at Source", *The Tribune*, September 18, 2017, https://www.tribuneindia.com/news/delhi/puri-stresses-segregation-of-municipal-waste-at-source/468790.html (last accessed May 30, 2019).
[654] Private formal sector representative, New Delhi, October 25, 2016.

This research concludes that India's MSWM is impacted by the varying levels of functionality of the three identified key components, meshing with one another like gear wheels, as depicted in Figure 10: first, the multitude of public and private sector actors involved in the development of a fitting regulatory framework results in a slow, complex and sometimes non-transparent process, which is marked by diverging and diverting interests and approaches. Secondly, India's MSWM infrastructure is rather based on quick-fix technologies than on innovative context-related approaches, when, ideally, India's MSW composition with a share of biodegradables of almost 50 per cent should determine the processing choice. Thirdly, the communities' awareness and participation in the management of their own waste is limited, resulting in a behaviour towards waste as well as towards (informal or formal) waste workers which can be characterised by aversion and necessity rather than by ownership and responsibility.

Figure 10: The three gear wheels of India's MSWM



Source: Author's own.

When analysing the evolution and implementation of India's MSWM agenda over the past thirty years, and especially the development in the past ten years, it becomes evident that the country is at a crossroad: one way leads to a scenario in which India establishes a waste collection and management system which results in high recycling rates and in materials finding their way back into the economy, which creates a circularity. The other way leads further into an inefficient scenario in which most of the MSW is disposed in landfills or incinerated,

which results in further environmental degradation and economic loss. Moreover, in the second scenario, the waste workers' contribution would be entirely diminished.

The identified three gear wheels all have their individual and combined impact on exactly this crossroad development, as strong policies, an adapted system and a change in the consumer behaviour are an important push for circularity. This research, considering also the time beyond 2016 and the notification of the SWM Rules, observes a distinct shift of the involved stakeholders from understanding waste as a burden on ULBs and the citizens to understanding waste as a resource. When understanding the "(…) waste hierarchy (…) as an 'historical' first step towards a current move away from the 'end of pipe' concept of 'waste management', towards the more integrated concept of 'resource management'"[655], then India's waste workers have spearheaded the understanding of the waste hierarchy concept ever since as the resource value of waste has always been the foundation for the waste workers' involvement in this economy. It is only in the past decade that also the official understanding of waste has altered, and waste is also recognised as a resource. This shift becomes evident when considering that in October 2017, the Ministry of Housing and Urban Affairs (MoHUA)[656] published a compendium named Waste to Wealth, which "(…) lay[s] out various technology options available in converting waste to wealth resource"[657] and which underlines the overall understanding of "(…) waste as a resource and not as garbage that should be discarded at the landfill site."[658] In November of 2017, NITI Aayog published India's Strategy on Resource Efficiency, which gives a very clear outlook for India's MSWM situation in connection to resource efficiency.

> In case of end-of-life stage policies, while there are policies existing to tackle all types of waste ranging from hazardous waste to Municipal Solid Waste (MSW), Construction and Demolition (C&D) waste, plastic waste and e-waste, enforcement has been limited due to lack of support for business models that lead to better implementation. There is a need to mobilize funding or cost of treatment for waste through Extended Producer Responsibility (EPR) and Polluter Pays Principle. Also, there is a need for a unifying framework that brings together these different sources of secondary raw materials for effective closed-loop recycling. To effectively manage the dispersed waste steams there is also a need to involve the informal sector by providing them with technical capacity building and financial support.
>
> Segregation of waste at appropriate place and time is an important factor towards ensuring the quality of secondary material recovered.

655 Wilson, "Development Drivers for Waste Management", 200.
656 In 2017, the MoUD was merged with the Ministry of Housing and Urban Poverty Alleviation, and together they were named Ministry of Housing and Urban Affairs.
657 Ministry of Housing and Urban Affairs, *Waste to Wealth. A Ready Reckoner for Selection of Technologies for Management of Municipal Waste*, 3.
658 Ibid., 5.

> Furthermore, there is a need to develop a system to specify, monitor, and control waste streams leading to data base for volumes and types of waste (…).[659]

Moreover, also the terminology in the public debate has altered over the past years. As outlined in Appendix-II: Inventory of Attended Conferences and Workshops the terminology in the context of waste-related events revolves around such terms as 'circular economy', 'resource efficiency', 'value of waste', 'sustainable lifestyles', 'inclusivity' and the 'reinvention of waste management'. Or, as a private sector representative puts it: "Waste management does not exist anymore, only resource recovery"[660]. Socially desirable solutions are those that create income opportunities[661], and low-cost and labour-intensive solutions, e.g. the reuse and conversion of waste into useful materials, can lead to poverty reduction. The reasons for India's shift towards resource management as opposed to waste management and the question of whether this shift is happening out of profit interest and/or out of a necessity due to resource scarcity continue to be debated. While some scholars argue that India's government turns towards recycling because rising commodity prices and the scarcity of certain materials reinforce the need for resource recovery – a situation which altogether results in recycling becoming a much more profitable business –, others have identified international donors pushing for an increased recycling or informal waste workers placing recycling on the ULBs agenda.[662] As a public sector representative stated: "For India RE is not an option, it is an imperative. A business imperative."[663] This imperative is connected to multiple elements, such conservation and saving, behaviour change, technology, efficiency and productivity, dematerialisation, durability and minimisation. The need for introducing the concept of life-cycle thinking into Indian waste policies has been expressed on multiple occasions in the public debate.[664] The introduction of the life-cycle approach would entail to look at all stages of a product's life in order to understand where the environmental impacts and the use of resources could be reduced and improved. Within the life-cycle approach it is key to ensure an overall environmentally beneficial approach and to avoid shifting the negative impacts from one stage to the other. A mix of policy and economic instruments as well as incentives and penalties are considered supportive for the entire approach.[665]

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659 NITI Aayog, *Strategy on Resource Efficiency* (New Delhi: Government of India, 2017) 21-22, 38.
660 Private formal sector representative, New Delhi, October 25, 2016.
661 Medina, "Globalization, Development, and Municipal Solid Waste Management in Third World Cities", 6.
662 Samson, *Forging a New Conceptualization of "the Public" in Waste Management*, 4; Chaturvedi, Vijayalakshmi, and Nijhawan, *Scenarios of Waste and Resource Management: For Cities in India and Elsewhere*, 7.
663 Public sector representative at the Confederation of Indian Industry (CII), International Conference on Resource Efficiency, November 2, 2017.
664 See Appendix-II: Inventory of Attended Conferences and Workshops for a list of conferences and workshops that dealt with the life-cycle approach.
665 Angie Silva, Michele Rosano, Laura Stocker et al., "From Waste to Sustainable Materials Management: Three Case Studies of the Transition Journey", *Waste Management* 61 (2017): 549.

6.1.1. Policy Frame and Adaptation

Over the past years, the prevailing approach to tackle India's MSW challenge has been the so-called 'cradle-to-grave' approach. With the SWM Rules, 2016 in place, however, there is now an additional understanding of the importance and relevance of (1) MSW segregation in order to be able to increase recycling rates and to reduce the pressure on landfills, (2) the need for decentralisation processes and (3) the criticality of the informal waste workers role in the overall system. The integration of these aspects into the exitising waste economy as well as the implementation of the same have proven dissatisfactory, especially when taking into account the timelines mentioned in the rules: while no timelines where mentioned for the recognition and integration of the waste workers, a national policy and strategy on SWM by the MoUD were supposed to be published after six months, hence by October 2016, and respective by-laws by cities were supposed to be published within one year of the notification of the rules, hence by April 2017. Both examples which, according to the rules, were supposed to be developed in coordination with relevant stakeholders including the waste workers did not meet the given timelines. The sheer variety of public stakeholders involved makes it challenging to follow through with these requirements, on the one hand, and to combine the diverse and sometimes opposing MSWM approaches, on the other hand. Moreover, having stakeholders blaming other stakeholders when commenting on the country's MSWM crisis adds to the complexity but also paralysis of the overall situation.[666]

While this research carved out a variety of MSWM approaches which are driven by different stakeholders, the clear assignment of these approaches to specific stakeholders has over time proven to be one challenge in this research frame: one reason for this is the fact that MSWM approaches do not seem to be institutionalised and mainstreamed among insitutions and sometimes even within one and the same insitution or agency. This leads to a situation in which one institution or agency might promote the overall waste hierarchy concept to, at a later point, neglect aspects of e.g. recycling processes and promote the incineration as the favourable MSW treatment option. Two examples for this discrepancy are from the Supreme Court of India and from NITI Aayog. In 1999, the Supreme Court of India stated:

> Nowadays, several technologies are being advocated by private entrepreneurs for the processing, treatment (...) of municipal solid waste. Some have Indian experience (…) whereas some are based on applications in foreign countries which are yet to be tried successfully or have failed in India, such as incineration, power generation and fuel

[666] Banjot Kaur, "Municipalities Responsible for Dirty India, Says Niti Aayog Ceo", *Down to Earth*, March, 19, 2019, https://www.downtoearth.org.in/news/waste/municipalities-responsible-for-dirty-india-says-niti-aayog-ceo-63632 (last accessed April 26, 2019).

> pelletisation. (…) The system of incineration is (…) not suitable under Indian conditions for (…) the following reasons: (…) the system is not environmentally friendly (…), high operation and maintenance cost, the system requires high technical skill to man it. The incineration of general municipal waste is therefore not recommended as a method of Municipal Solid Waste disposal.[667]

In 2018, India's Supreme Court proceedings on a matter related to the development of another landfill and WtE plant in Delhi's Ridge area[668] consider "[w]aste to Energy (…) [being] the most eco friendly method of disposal of MSW"[669], underlining the complete U-turn the Supreme Court has made, from considering incineration as not suitable and not environmentally friendly to considering WtE and incineration as the most eco-friendly treatment method for MSW. In April 2017, NITI Aayog addressed the increasing amounts of MSW and the connected consequences in their Three-Year Action Agenda as following:

> On methods of final disposal, options such as biogas and composting are not suitable solutions in larger cities since they generate by-products or residues in large volumes that these cities will find difficult to dispose of efficiently. Only incineration (also called Waste to Energy), thermal pyrolysis and plasma gasification technologies offer the sustainable disposal solutions. (…) incineration or "Waste to Energy" is the best option.[670]

The clear push towards incineration as the most favourable MSW treatment option has been critically observed[671]. "NITI fails to point out that when incineration plants in cities use unsegregated waste to generate electricity, they emit toxic gases as by-products and irresponsibly dispose of these 'dangerous by-products' in the air."[672] While some critiques welcome this announcemnt in order to be able to tackle the increasing mountains of waste, they simultaneously express their doubts when stating:

> There are, however, mixed reports on existing waste to energy plants operating in the country on technical and environmental grounds. At the core of the problem is the nature of urban waste in the country, it contains a mix of materials that is unsuitable for efficient incineration.[673]

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667 Supreme Court of India, *Solid Waste Management in Class 1 Cities in India. Report of the Committee Constituted by the Hon. Supreme Court of India*, 3.15.
668 For more details on the developments around the development of a landfill and a WtE plant in Delhi's Ridge area see Chapter 6.2.
669 Supreme Court of India, *Record of Proceedings. Writ Petition(S) (Civil) No(S). 202/1995*.
670 NITI Aayog, *Three Year Action Agenda 2017-18 to 2019 - 20* (New Delhi: Government of India, 2017) 55–56.
671 "Niti Aayog Suggests Waste to Energy Plants to Clean up Solid Waste", *The Economic Times*, August 27, 2017, https://economictimes.indiatimes.com/news/economy/policy/niti-aayog-suggests-waste-to-energy-plants-to-clean-up-solid-waste/articleshow/60244081.cms (last accessed April 26, 2019); Isher Judge Ahluwalia, "Managing India's Municipal Solid Waste: Here Are Some Action Points", *Financial Express*, May 31, 2017, https://www.financialexpress.com/opinion/managing-indias-municipal-solid-waste-using-incentives-and-penalty/693749/ (last accessed April 26, 2019); Sudhirendar Sharma, "Confronting the Challenge of Mounting Waste", news release, July 6, 2017, http://pib.nic.in/newsite/printrelease.aspx?relid=167191.
672 Ahluwalia, "Managing India's Municipal Solid Waste: Here Are Some Action Points".
673 Sharma, "Confronting the Challenge of Mounting Waste".

Only seven months later, in November 2017, NITI Aayog published an elaborate Strategy on Resource Efficiency, in which it also addresses the MSW challenge the country is facing by underlining the need to create a unifying framework for effective closed-loop recycling and emphasises the need for segregation to ensure the quality of recovered material. In addition, the strategy highlights the need to involve the informal sector in order to manage the waste streams.[674] While these two examples from the recent past highlight the existing incoherency that, for the purpose of research, increased the challenge of identifying a common thread in the complex landscape of Indian MSWM documents, they more so underline the existing silo-thinking, even within one and the same institution or agency. This silo-thinking becomes even more evident when considering the approaches of different public stakeholders, such as in the case of NITI Aayog and the MoHUA: while in 2017, as mentioned earlier, NITI Aayog considered biogas and composting not to be "(…) suitable solutions in larger cities since they generate by-products or residues in large volumes that these cities will find difficult to dispose of efficiently"[675], in 2018, the MoHUA published an Advisory on On-Site and Decentralized Composting of Municipal Organic Waste. In this advisory, the MoHUA states:

> In order to reduce the burden of unscientific handling of large volumes of Municipal Solid Waste, the ULBs need to shift their focus from centralised 'single stream' collection and 'dump/Landfill disposal' system to 'multiple stream' collection and scientific onsite/decentralised 'processing' system. (…) This advisory is brought out for enabling implementation of Solid Waste Management Rules 2016, to promote onsite and decentralised organic solid waste treatment systems in the Country. (…) The motto of this advisory is to bring about disruptive change in the current system of end of the chain waste treatment and make the onsite & decentralised organic solid waste treatment systems more common and adaptable.[676]

While overall emphasising the need to adopt the waste hierarchy system, the MoHUA clearly turns towards the option and the promotion of a decentralised and compost-oriented treatment structure for India's MSWM, something the NITI Aayog only advises for smaller cities.

> Collaborate across all levels of government, both national such as Ministries, and local. Waste management has traditionally been the policy domain of Ministries of Environment and Urban Development, with local governments implementing their policies. However, (…) a joined-up approach necessitates collaboration with other national Ministries such as Industry, Finance, and Science and Technology. This breaking up of silos is critical for the transformation from a waste management to a resource management perspective.[677]

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[674] NITI Aayog, *Strategy on Resource Efficiency*, 21–22, 38.
[675] NITI Aayog, *Three Year Action Agenda 2017-18 to 2019-20*, 55–56.
[676] Ministry of Housing and Urban Affairs, *Swachh Bharat Mission - Urban. Advisory on on-Site and Decentralized Composting of Municipal Organic Waste* (New Delhi: Government of India, 2018) Foreword.
[677] Wilson, "Managing the Emerging Waste Crisis in Developing Countries' Large Cities", 4.

The involvement of ten ministries and line agencies in setting a coherent agenda for India's MSWM leads to a situation which can be characterised by diverse MSWM approaches, on the one hand, and the lack of ownership, on the other hand. Breaking away from the waste management silos and moving towards a material management instead is essential in order to create an inclusive participatory policy arrangement. This research identifies the existing waste management silos in India as one of the most challenging hurdles in the realm of a coherent MSWM policy development and implementation. While issues related to other fields such as energy efficiency are managed centrally by India's Bureau of Energy Efficiency which is an agency under the Ministry of Power, MSWM is coordinated by multiple stakeholders in a rather scattered way. In NITI Aayog's Three Year Action Agenda, NITI recognises the need for a central authority, which shall be dedicated to municipal solid waste management. However, NITI Aayog pinpoints this to be related to WtE when it states:

> To speed up the process of cleaning up municipal solid waste, it may be worth exploring the possibility of an authority at the Centre to spread the use of Waste to Energy plants. Such an authority can be called Waste to Energy Corporation of India (WECI) and placed under the Ministry of Urban Development.[678]

NITI Aayog's consideration of the requirement for a central agency, which would manage the process of India's MSWM, is welcome, the question here is if this central authority should be limited to WtE aspects or if it should take into account other waste management aspects as well, such as reduction and recycling. A central MSWM agency covering multiple aspects of the waste management chain would be especially relevant when considering that the waste hierarchy concept is an accepted concept in India's MSWM policy setting.

Having established the waste hierarchy also as the underlying concept for this research, the analysis of India's MSWM agenda demonstrates that the waste hierarchy concept and elements thereof have increasingly gained importance in shaping the overall perspective policy developments. While all elements of the waste hierarchy concept have their importance, the challenges to introduce or further establish them in India's policy framework vary from element to element and depend on the complementary promotion of policy and economic instruments. "Economic instruments do not substitute but complement and strengthen regulatory ('command-and-control') and informational approaches. As such, they are an important component of the policy mix and not 'stand-alone' policy instruments."[679]

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[678] NITI Aayog, *Three Year Action Agenda 2017-18 to 2019-20*, 56.
[679] Gunsilius, *Economic Instruments in Solid Waste Management: Applying Economic Instruments for Sustainable Solid Waste Management in Low-and Middle-Income Countries*, 18.

This research concludes that the promotion of policy and economic instruments in the Indian MSWM regulatory framework is still relatively weak. User fees to be paid by the MSW generator along the lines of the 'pay-as-you-throw' principle are not mainstreamed within the regulatory framework. Instruments such as incentives to promote waste separation at the source or penalties for nonfulfillment of the mandatory source segregation have also not yet been introduced. Practitioners from the field continue to call for articulated municipal by-laws for segregation and the introduction of performance assessment and evaluation of source segregation,[680] as a clear source segregation would lead to reduced recycling costs and is essential for all treatment options, be it composting, recycling or incineration, since WtE plants need to run on segregated waste. The role and responsibilities of the industries, being the manufacturers of products and therefore potential waste, are not sufficiently defined. EPR as a policy instrument is crucial in order to establish a circular economy thinking. Even the first element of the waste hierarchy concept, reduction, ideally has to happen at the institutional level through EPR. The incentivisation of the manufacturing of "green" products and packaging and the incentivisation of the use of recycled material in the production process are just two examples which would support the circular approach. Questions as to what extent of reduction is actually needed in order to reduce India's MSW generation could be addressed in possible future research. Innovation plays an important role when it comes to product design. While India's MSW composition should ideally determine the required processing or treatment, the majority of MSW is still landfilled. The increment of landfill levies and the introduction of landfill taxes would encourage diverting waste from landfills, as this "(…) serves as an incentive to divert waste from landfills and channel it towards treatment and recycling, provided that the tax is sufficiently high to make the other options an economically viable alternative. In some countries incineration is also taxed."[681]

With almost 50 per cent of biodegradable waste, India has a high potential to compost or generate biogas out of segregated wet waste. There is a growing number of people calling for hybrid solutions towards a scenario in which landfills are only used for rejects and inerts or even towards zero landfills, incineration that runs on non-recyclables and higher composting and recycling rates.[682] For this purpose, policy measures would be required, such as setting laws with targets for landfill diversion, extended producer responsibility, landfill bans for recyclable material and the setting of recycling and composting goals. The proper regulation

[680] Private formal sector representative, New Delhi, October 25, 2016, NGO representative, New Delhi, February 11, 2017 and NGO representative May 20, 2017.
[681] Gunsilius, *Economic Instruments in Solid Waste Management: Applying Economic Instruments for Sustainable Solid Waste Management in Low-and Middle-Income Countries*, 18.
[682] NGO representative, New Delhi, February 11, 2017 and NGO representative May 20, 2017.

of recycling, also in relation to sorting conditions and in terms of the economics and quality of recycling, is key. An increment in the volumes of recycled materials would eventually support the urban economy by providing employment opportunities.[683] The implementation of policies, such as recycling policies, can set the framework conditions for the transition towards a circular and resource-efficient economy as they encourage recycling commitments by municipalities. The creation of a transition arena would require a reconceptualisation of governance: instead of understanding MSWM in the traditional way with the government, households and the waste companies as the key actors, a reconceptualisation of governance would entail transitioning to a "(…) multi-level and multi-actor governance structure (…)"[684], which would put a focus on the involvement of informal waste workers in the official MSWM economy. As outlined in the research, the role of waste workers in the Indian MSWM context is complex, and the surrounding legal, economic and social circumstances are challenging. The structures of the formal system make an involvement of or a cooperation with the informal waste workers challenging. Moreover, the lack of experience of public stakeholder to integrate informal workers into existing structures adds to the continuous displacement of informal waste workers. While the involvement of waste workers in the planning of processes and the development of recommendations for possible institutionalised structures has been included in the SWM Rules, 2016, no timelines for the implementation of this provision are mentioned. It is often emphasised that "(…) this sector can only develop its full potential for recovering resources from waste if it is recognised, integrated and supported to establish more efficient processes."[685]

> We need to incorporate and not negate the role of the recycling industry in waste management. Currently, it is said (data is weak however) that recycling of dry waste provides employment to about 1-2 percent of a city's population, often the poorest women and children. In large cities, there are two-three tiers of waste buyers, all very well organised and specialised in specific wastes. What is not recognised is that this trade, happening in the backyards of slums and shoved aside by policy, is the only thing saving cities from drowning in waste. It is also this trade which ensures that less waste reaches landfills.
>
> There is a great need for official support to this unappreciated activity that saves at least 10-15 percent in transportation costs daily to the city, adding up to millions of rupees a year. Over the years, civil society groups working with informal waste collectors have worked on several policies to promote this business—starting a dialogue to find out the needs of this sector, issuing ID badges to waste pickers who desire them (through NGOs or police, to prevent harassment), providing them with sorting and storage space, and doorstep pickup

683 UN-Habitat, *Solid Waste Management in the World's Cities*, 20.
684 Silva, Rosano, Stocker et al., "From Waste to Sustainable Materials Management: Three Case Studies of the Transition Journey", 551.
685 Gunsilius, Spies, García-Cortes et al., *Recovering Resources, Creating Opportunities: Integrating the Informal Sector into Solid Waste Management*, Preface.

service for post-sorting rejects to be taken away from slum houses or waste buyers' yards, so that these do not end up clogging the storm drains.[686]

The informal waste workers debate circles around the recognition and integration of waste workers as well as around an improvement of their social and economic status and the means to reach them. The question raised by this research stands in relation to the definition and understanding of informality and how suitable and timely the definition outlined in Box 10 remains in the context of India. With more than 80 per cent of the non-agricultural workforce being considered 'informal' according to the common definition of informality[687] and an estimated 1.5 million informal workers[688] being active in India's MSW system, the sheer number of people working in so-called informal circumstances might call for a reconceptualisation and redefinition of what 'informal' means in the Indian context. An Indian definition of informality might open up the traditional system of 'formal' versus 'informal' and 'official' versus 'inofficial' and might give way for possible synergies to officially materialise between waste workers and ULBs or other stakeholders involved in MSWM. An Indian-specific definition of informality would also give room for new perspectives on often-discussed questions related to the integration or formalisation of waste workers.

6.1.2. Infrastructure and Innovation

"Developing country cities are still experiencing rapid population growth, so one element of an integrated solid waste management solution has to be how to tackle exponential growth in waste quantities"[689] The past thirty years in Indian MSWM can be characterised by attempting to find solutions for the amounts of MSW already generated. In the more recent years, the involved stakeholders predominately attempted to tackle the challenge by either landfilling, open burning or incineration. One focus throughout finding suitable treatment solutions has been on quick-fix technological infrastructure solutions in the form of incineration or WtE plants for example. While the pitfalls of MSW incineration as outlined in Table 8 are known to all stakeholders involved, the SWM Rules, 2016 promote MSW incineration. Other government bodies support the continuous push towards incineration as well, such as NITI Aayog in the Three Year Action Agenda, when elaborating that decentralised

686 Narain, "Garbage Is About Recycling".
687 International Labour Organization, "Informal Economy in South Asia", International Labour Organization, https://www.ilo.org/newdelhi/areasofwork/informal-economy/lang--en/index.htm (last accessed May 16, 2019).
688 Chintan, "Scavengers to Managers"; Bose and Bhattacharya, "Why Ragpickers, Unrecognised and Unpaid, Are Critical for Waste Management in India".
689 UN-Habitat, *Solid Waste Management in the World's Cities*, 13.

technologies such as composting are not suitable for larger cities and incineration is the only solution:

> On methods of final disposal, options such as biogas and composting are not suitable solutions in larger cities since they generate by-products or residues in large volumes that these cities will find difficult to dispose of efficiently. Only incineration (also called Waste to Energy), thermal pyrolysis and plasma gasification technologies offer the sustainable disposal solutions. However, pyrolysis is not suitable for MSW due to its diverse composition and plasma technology remains too costly to adopt so far. Hence, incineration or "Waste to Energy" is the best option. Singapore and other countries have waste incinerators.[690]

Considering the rising quantities of India's MSW, incineration of non-recyclable material is certainly a welcome option as an end-of-pipe solution. However, the substantial investments in infrastructure and capacities, which are required for setting up and running large infrastructures, pose a pronounced challenge for municipalities. Due to the lack of finances, municipalities continue to outsource these set-ups to private companies, which leads to a whole set of other challenges, especially in relation to the waste workers.[691] The other pronounced challenge in the context of large infrastructural solutions is the level of segregation of MSW: incineration plants require to run on segregated waste. While source segregation has been made mandatory in the SWM Rules, 2016, unawareness on the community-level, the lack of space for bin adaptations as well as infrastructural hurdles lead to unsegregated waste (see Box 5). Practitioners from the field continue to raise concerns about the sufficiency of the three-bin distribution, that was introduced with the SWM Rules, 2016, and call for the propagation and special design of a source segregation infrastructure.[692]

This research concludes that the front-end solutions for tackling waste quantities, hence addressing waste before it is generated, currently receive less attention compared to the end-of-pipe solutions. With questions related to a more sustainable and 'green' product design as well as local production and consumption being increasingly discussed in the public debate, the requirement of a system change beyond conventional waste management towards material management is addressed.[693] The impacts of these discussions on the policy framework are just starting to show through, for instance, the Strategy on Resource Efficiency[694] and the questions related to what tools should be used to tackle exponential MSW growth become more frequent. However, as of now, technology upgradation and production remain the

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690 NITI Aayog, *Three Year Action Agenda 2017-18 to 2019-20*, 55–56.
691 Coad, *Private Sector Involvement in Solid Waste Management: Avoiding Problems and Building on Successes.*
692 NGO representative, New Delhi, February 11, 2017 and NGO representative May 20, 2017.
693 See Appendix-II: Inventory of Attended Conferences and Workshops for further information.
694 Silva, Rosano, Stocker et al., "From Waste to Sustainable Materials Management: Three Case Studies of the Transition Journey".

main topics on the MSWM agenda of public and formal private stakeholders. The shift towards a more innovation-oriented MSWM system highly depends on the ecosystem in which innovation can flourish and on the role the industries play. Until now, the role and responsibilities of the industries, i.e. the manufacturers of products and therefore of potential waste, is not sufficiently defined. While instruments such as EPR are crucial, the aspect of innovation also plays a key role. The two main drivers of innovation are cost competitiveness and profitability. In this way, infrastructure and innovation go hand in hand as the gear wheel of the policy instrument EPR meshes together with the gear wheel of innovation. The incentivisation of the manufacturing of "green" products and packaging and the incentivisation of the use of recycled materials in the production process are just two examples which would promote innovative approaches and support the transition to a circular economy.

6.1.3. Behaviour and Habit

A transition away from conventional MSWM towards an increased resource management with higher rates of repair and reuse, higher recycling rates and more home composting require a habitual behaviour change.[695] Behaviour and habit in the field of waste management, as an active area of applied research, is a very complex element and constitutes the third identified gear wheel of India's MSWM in this research: this gear wheel can be connected to three different aspects, namely (1) habits and behaviours in relation to consumption, (2) habits and behaviours in relation to the handling of the waste material itself and (3) habits and behaviours towards the person making a living from MSWM. Since the whole Indian population can be a potential consumer and hence a potential waste generator, the impacts and consequences of the three mentioned realms of behaviour and habit are manifold and far-reaching.

It is an interesting observation which I have made during the waste conferences and workshops that multiple public sector stakeholders as well as academics of the field of MSWM perceive India as a country which used to be a so-called "recycling society"[696] the basis of which was an inherent and natural circular economy system. In this context and also in government documents, India is often portrayed as a country that has transformed "(…) from a recycling to a throw-away society"[697]. This perceived transformation is directly linked to the increase in plastics production since the 1990s and the ensuing changing consumption patterns. While the increment of plastic consumption and production is certainly a fact, it

[695] Wilson, "Development Drivers for Waste Management", 201.
[696] Public sector representative at Confederation of Indian Industry (CII), International Conference on Resource Efficiency, November 2, 2017.
[697] National Institute of Urban Affairs, *Status of Water Supply, Sanitation and Solid Waste Management*, 125.

remains a question if and to what extent the Indian society used to be a recycling society and a circular society by choice rather than necessity. An NGO representative called this perception a "romanticised history-making"[698], since "(…) the Indian population might have been better in reusing or recycling due to necessity, but not because it was something to strive for. People might have reused clothes as a cleaning cloth later, but they only did this because they did not have any other means."[699] The increasing amounts of packaging material in particular pose one of the biggest challenges, and the use of plastic material has been addressed in multiple government documents and programmes. NITI Aayog addresses the increment in plastic usage by stating that the "(…) behavioural side of plastic usage should also be addressed, with information campaigns against unnecessary use of plastic and Point of Sale charges for plastic bags that encourage people to use recyclable material."[700] Consumption and MSW generation are often also related to awareness or knowledge or the lack thereof. The unawareness of the consequences of an increased waste generation and the ignorance about what is going to happen with the waste once it leaves the respective source were often a matter of discussion in the interviews. Many times, the interviewees were "surprised"[701] about the consequences of an increased waste generation and showed interest in the topic and said that they had not known "where to extract the information from"[702].

This gap between knowledge or awareness and behaviour or habit has the same far-reaching consequences when considering how MSW is handled by waste generators.

> The waste should normally be stored at the source of waste generation till collected for its disposal. In India, such a habit has not been formed and in the absence of system of storage of waste at source, the waste is thrown on the streets, treating streets as receptacle of waste. If citizens show such apathy and keep on throwing waste on streets and expect that municipal sweepers should/ would clean the city, the cities will never remain clean. Even if local bodies make arrangements to remove all the waste disposed of by the citizens on the street on day to day basis, the city will remain clean only for two to three hours and not beyond till the habit of throwing waste on the streets is not changed. There is, therefore, a need to educate the people to store waste at source, dispose of the waste as per the directions of the local bodies and effectively participate in the activities of the local bodies to keep the cities clean.
>
> For keeping streets and public places clean throughout the day, it is necessary that waste producers co-operate and effectively participate in the waste management efforts of local bodies. People, therefore, may be educated to form a habit of storing waste at source in their personal bin/bins and deposit such waste into the municipal system only, at specified

[698] NGO representative in the World Environment Day 2018.
[699] NGO representative in the World Environment Day 2018.
[700] NITI Aayog, *Three Year Action Agenda 2017-18 to 2019-20*, 164.
[701] Arjun, thirty-five, Uday Park, June 2, 2017.
[702] Komal, thirty, Dwarka, November 4, 2016.

time.[703]

The MoUD denounces citizens to show signs of "apathy" in regard to a clean city: understanding apathy as a lack of concern or lack of interest, this statement clearly underlines the MoUD's assumption that although waste generators have the required knowledge to handle their MSW appropriately, the behaviour in the context of handling their own MSW is characterised by indifference. This gap between MSWM knowledge and context-appropriate habits or behaviour leaves space for future research. The research at hand rather claims that there is a lack of ownership or civic sense in relation to the public space and, more than that, a lack of ownership for one's own generated waste. Statements along the lines of "I am just happy when it's not in my flat"[704] or "We simply do not have the space to keep multiple bins at home"[705] or "We keep paper and glass separate, the rest we keep in one bin, as it also gets picked up that way"[706] were expressed several times during the interviews, which not only hint at a lack of ownership and knowledge but also at a sense of helplessness in regard to the handling of one's own household waste. Source segregation and storage at source are two key components of the MSWM chain, which are potentially part of the area of accountability of the waste generators. With source segregation becoming mandatory in the SWM Rules, 2016, one of the waste generators' responsibilities has been defined. The implementation and monitoring of source segregation, however, has proven to be a challenge. "The contributors need to be the solvers. We need more citizens participation, support and cooperation to enforce and implement government policy and schemes. Be the example instead of pointing fingers."[707]

The third aspect in the context of behaviour and habit is related to the waste generators' behaviour towards the person, formal or informal, working with waste. MSW is rarely seen as a good or as a source that is partly recyclable and therefore useful. The informal waste workers who substantially contribute to a circularity of the existing waste flow are far too little, if at all, appreciated. As outlined in Box 4, Box 8, Box 11, the work with waste is looked upon with aversion and the people working with waste are considered as at least dubious. Especially the relation between the waste generators and the people engaged in the informal waste economy is shaped by ignorance, and often the waste workers are either not or only negatively noticed by the surrounding society. Every day, the waste workers "(…) fight for

[703] Ministry of Urban Development, *Advisory on Improving Municipal Solid Waste Management Services*, 6–7.
[704] Chitra, sixty-one, South Extension II, May 5, 2017.
[705] Komal, thirty, Dwarka, November 4, 2016.
[706] Arjun, thirty-five, Uday Park, June 2, 2017.
[707] NGO representative, New Delhi, February 11, 2017.

the right to live as an acknowledged, useful part of the urban ecosystem"[708]. While the SWM Rules, 2016, recognise the contribution of the informal waste workers and provide for an integration of the waste workers in the strategic decision-making processes, there is neither an implementation guidance nor a timeline for the implementation of this provision. Moreover, the cultural aspects surrounding the whole topic of waste in India remain deep-rooted: MSW is yet considered something 'dirty' and the main focus lies on the removal of the refuse from the field of vision. As long as waste generators do not feel a sense of ownership for the generated waste and refuse is not seen as a good, the work with waste continues to be regarded with aversion.

"As new services require behavioural change on the part of citizens and municipal waste departments alike, communication and exchange with other stakeholders function as enabling and supporting factors."[709] The waste generators' readiness to make a behavioural change accompanied by societal openness and civic engagement are certainly two of the required prerequisites. Considering the outcomes of the community-level interviews regarding waste segregation (see Box 5), this research concludes that one prerequisite for waste generators to adapt their behaviour towards generated waste is that waste and recycling infrastructure, processes and systems need to be in place. This underlines the waste generators' valid demand for the public and private sector to take the first step when it comes to implementing sustainable, effective and environment-friendly MSWM systems. Moreover, this often-claimed demand from the community level underlines how interlinked the three (identified) gear wheels are: the regulatory framework is like a corset which sets the guidelines for innovation and infrastructure and shapes behaviour and habits. The behaviour and habits are in turn directly interlinked with infrastructure and innovation as the community level expressed its dependency on the given framework as well as infrastructure.

6.2. Outlook on Delhi

The transformations which Delhi's MSWM economy has undergone since the beginnings of the 2000s are shaped by the ongoing attempts of the public sector actors to handle the increasing amounts of MSW. The outsourcing of MSWM to large waste management companies has so far been the dominant mechanism to tackle Delhi's MSW challenge. The continuous privatisation of elements of the waste management chain, from door-to-door collection to transport and treatment, has shaped the developments of Delhi's MSWM economy. The

[708] Chaturvedi, *Finding Delhi: Loss and Renewal in the Megacity*, xi.
[709] Rodic and Wilson, "Resolving Governance Issues to Achieve Priority Sustainable Development Goals Related to Solid Waste Management in Developing Countries", 1.

establishment of incineration plants continues to attract the interest of public stakeholders as they are often considered to be a one-stop shop with which municipalities are seemingly able to make MSW disappear from the public eye. By privatising certain elements of the MSWM chain and turning towards incineration as a solution to tackle Delhi's MSW amounts, public stakeholders appear to neither consider the economic and social implications that a further privatisation of MSWM has on Delhi's informal waste workers nor do they appear to fully consider the adverse impacts of improper incineration on the environment. The privatisation of Delhi's MSWM services in the past decades has had various adverse impacts on the capital's informal waste workers. The calls for regulatory mechanisms remain so that the informal waste workers are recognised for their activities and contribution. Also, Delhi's MSW treatment figures underline that the chosen path of privatisation and incineration cannot entirely solve Delhi's MSW situation as no improvement of the overall situation is taking place: by 2015 and 2016, the collection efficiency in Delhi was about 60 to 70 per cent[710], the landfill disposal rate of Delhi's collected MSW was an estimated 65 per cent and the incineration rate 11 per cent.[711] While the waste generation figures for Delhi are still increasing, the most common treatment option remains the landfilling. The incinerated parts of the MSW, are incinerated improperly, due to unsegregated waste, leading to lost recycling or composting opportunities and adverse environmental, social and economic impacts. The analysis in this research therefore concludes that sustainable MSWM in Delhi cannot be achieved merely by purchasing quick-fix technologies and by a continuous privatisation of the MSW economy. The consequences thereof are: firstly, an MSW-unrelated technology setting; secondly, an increasingly threatening livelihood situation of the waste workers involved; and thirdly, overall insufficiently involved and responsible stakeholders, including ULBs, waste generators and industries. Instead, an inclusive, innovative and circular waste economy model would certainly be beneficial for a city which generates an estimated nine thousand tonnes of MSW per day and which is should be able to handle continuously increasing future MSW amounts: it is estimated that due to the increasing urbanisation and continuous in-migration and immigration into the city, the MSW generation is likely to increase to between seventeen and twenty-five thousand TPD already by 2021.[712] Even if the lower end of this spectrum, namely seventeen thousand MSW TPD, is considered, Delhi

[710] NGO representative, New Delhi, February 11, 2017; Kaushal, Varghese, and Chabukdhara, "Municipal Solid Waste Management in India-Current State and Future Challenges: A Review", 1481.
[711] Salenson, "Waste Recycling Systems in Emerging Cities".
[712] Talyan, Dahiya, and Sreekrishnan, "State of Municipal Solid Waste Management in Delhi, the Capital of India"; IL&FS Ecosmart Limited, *City Development Plan Delhi*; Hoornweg and Bhada-Tata, *What a Waste: A Global Review of Solid Waste Management*, 61; Chintan, *Space for Waste Planning for the Informal Recycling Sector*, 2.

would face an almost 80 per cent hike within five years, which would put even further pressure on the already strained system and the involved stakeholders.

> (…) three million tonnes of waste can be accommodated on 40 ha of land (keeping in mind that the life of a landfill is 20 years). Delhi needs 800 ha of land, which would cost Rs 80,000 crore going by the present circle rate! But the city simply does not have the land.[713]
>
> What's obvious (…) is that hybrid plans are needed to save the cities from drowning in their garbage. A mix of technologies such as biomethanation, composting, conversion to refuse-derived fuel (RDF) and converting waste to power generation is the only solution.[714]

In addition to this, NGO representatives and policy advisors from the field call for institutional reforms and decentralised MSW treatment infrastructures, which would also include the recognition and incorporation of or cooperation with informal waste workers.

> Such an inclusive model of decentralised waste management under a zero-waste strategy would eliminate the need for incinerators and minimise pressure on landfills […]. Policymakers in alliance with waste workers, residents and NGOs could develop labour-intensive (rather than capital-intensive) solutions based on social justice and environmental sustainability along these lines.[715]

While the SWM Rules, 2016 were to set the stage for an improved handling of the generated MSW, the urgency of the issue at hand and the challenges connected to the implementation of the given set of rules remain to be ever-present throughout Delhi.[716] The years after the notification of the SWM Rules, 2016 are shaped by multiple developments in the policy realm as well as in Delhi itself, which are accompanied by an ongoing public discourse revolving around Delhi being "the world's most polluted city in the world"[717], Delhi's solid waste

[713] Singh Sambyal, "Delhi's Solid Waste: As Systemic Failure".
[714] Ibid.
[715] Schindler, Demaria, and Pandit, "Delhi's Waste Conflict", 20.
[716] Singh Sambyal, "Delhi's Solid Waste: As Systemic Failure"; Vikram Kumar, "Clock Ticks for Cities to Meet Deadline on Garbage Management. Urban Affairs Ministry Directs States to Fast-Track Work So That All Cities Have Solid Waste Treatment Facilities by October 2 Next Year", *The New Indian Express*, March 18, 2018, http://www.newindianexpress.com/thesundaystandard/2018/mar/18/clock-ticks-for-cities-to-meet-deadline-on-garbage-management-1788752.html (last accessed April 10, 2019).
[717] Vyawahare, "Delhi World's Most Polluted City, Mumbai Worse Than Beijing: WHO".

system being a "systemic failure"[718], irregularities in the salary payment to *karamcharis* as well as the construction of new WtE plants and an additional landfill next to the Yamuna.[719]

Only two months after the MoEFCC had published the revised SWM Rules, 2016, the EDMC of Delhi proposed to develop a 150-acre site on the floodplains of the Yamuna for the establishment of a landfill and a WtE plant on DDA-owned land. While activists immediately pointed out that the establishment of a landfill along the banks of the Yamuna river is "(…) dangerous (…)"[720], since the "(…) Yamuna is already one of the most polluted rivers in the world due to decades of neglect by the government and citizens" [721] and media stressed on the fact that this is a "(…) bad idea (…)"[722], this proposal majorly violated multiple legal provisions, such as the EPA, an NGT order from 2015, which mandated that any activity on the flood plain has to comply with an expert committee and the Solid Waste Management Rules, 2016: the SWM Rules, 2016 include a prohibition that the "(…) landfill site shall be 100 meter away from river (…) [and] [t]he Landfill site shall not be permitted within the flood plains as recorded for the last 100 years, zone of coastal regulation, wetland, Critical habitat areas, sensitive eco-fragile areas."[723] Following the EDMC proposal, the DDA requested the DPCC and the NGT to give clearance for this land to be utilised for a landfill and a WtE plant. At the same time, Delhi's activists started a petition against the development of such a landfill or processing facility on the banks of the Yamuna, stating,

> This is the most dangerous place to build a landfill. (…) Garbage, toxins & heavy metals will flow directly from this landfill into the Yamuna. These toxins will enter our drinking water creating a health crisis. (…) The Yamuna bank is an active floodplain which drains directly into the river. (…) We must show the authorities right away that there is massive

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[718] Singh Sambyal, "Delhi's Solid Waste: As Systemic Failure".

[719] Vyawahare, "Delhi World's Most Polluted City, Mumbai Worse Than Beijing: Who"; Singh, "Salary Hike Rollback Raises a Stink"; Sharma, "North Delhi Municipal Corporation to Start Work on Waste-to-Energy Plant at Bhalswa by August End"; Richa Agarwal, "Why a Landfill and Waste-to-Energy Plant in Delhi Ridge Is a Bad Idea", *Down to Earth*, July 20, 2018, https://www.downtoearth.org.in/news/waste/why-a-landfill-and-waste-to-energy-plant-in-delhi-ridge-is-a-bad-idea-61191 (last accessed April 9, 2019); "Delhi Civic Polls: AAP Promises Fixed Jobs, Regular Pay to Safai Staff", *The Times of India*, April 12, 2017, https://timesofindia.indiatimes.com/city/delhi/aap-promises-fixed-jobs-regular-pay-to-safai-staff/articleshow/58136511.cms (last accessed April 9, 2019); Kumar, "Garbage Politics Stinks Delhi: Who Should Be Blamed - Kejriwal, BJP or You?"; "Kejriwal Slams EDMC for 'Misleading' Karamcharis", *The Hindu*, October 05, 2018, https://www.thehindu.com/news/cities/Delhi/kejriwal-slams-edmc-for-misleading-karamcharis/article25127578.ece (last accessed May 27, 2019).

[720] Vimlendu Jha, "Delhi's Plan to Create a Landfill Along the Banks of the Yamuna Is a Downright Dangerous Idea", December 18, 2016, https://scroll.in/article/824279/delhis-plan-to-create-a-landfill-along-the-banks-of-the-yamuna-is-a-downright-dangerous-idea (last accessed May 27, 2019).

[721] Ibid.

[722] Ritam Halder, "Landfill on the Banks of Yamuna a Bad Idea, Find Another Spot: Activists Urge Jung, Kejri", *Hindustan Times*, December 09, 2016, 2016, https://www.hindustantimes.com/delhi-news/landfill-on-the-banks-of-yamuna-a-bad-idea-find-another-spot-activists-urge-jung-kejri/story-fu5Lm92KkLB7C4c8Pbkm0J.html (last accessed May 27, 2019).

[723] Ministry of Environment, "Solid Waste Management Rules, 2016", Schedule I, A (vii).

public opposition to building a landfill on the Yamuna banks. We must unite now to protect the Yamuna, our water and our health.[724]

The beginning of 2017 was marked by ongoing strikes of the EDMC and the NDMC sanitation workers as their salaries had not been paid. While this situation had its own implications on the everyday lives of the sanitation workers, it underlined the continuation of the political dynamics in Delhi, where the AAP-led Delhi government confronted the BJP-led MCD and vice versa.[725] While in March of 2017, The North Delhi Municipal Corporation launched Delhi's third and India's largest WtE plant at Narela-Bawana[726], the following months were dominated by attempts to take steps towards the implementation of the SWM Rules, 2016. One major focus was on the matter of source segregation.[727] In this context, the then MoUD launched an initiative called Segregation of Municipal Waste at Source Initiative for National Capital Region.[728] The objective of the initiative was to segregate wet and dry waste at source to then be put in green and blue bins, respectively. In this context, the NDMC and EDMC launched a waste management project, which was covering ten neighbourhoods in the area of the NDMC and the EDMC. The goal of this project was to work together with the residents and waste workers towards a better source segregation rate in order to be able to increase the rate of MSW composting or recycling.[729] Moreover, the SDMC introduced Mobile Transfer Stations (MTS) to its fleet in order to support the segregation process.[730] In September of that same year, parts of the Ghazipur landfill, which has been saturated for

724 Vimlendu Jha, "No Landfill on the Banks of Yamuna, Find Another Site", change.org, https://www.change.org/p/no-landfill-on-the-banks-of-yamuna-find-another-site (last accessed May 27, 2019).

725 "Delhi Civic Polls: AAP Promises Fixed Jobs, Regular Pay to Safai Staff"; Kumar, "Garbage Politics Stinks Delhi: Who Should Be Blamed - Kejriwal, BJP or You?"; Kukreti, "Raising a Stink: MCD Workers Survive on Salaries of Rs 9000".

726 Sharma, "India's Largest Solid Waste-to-Energy Plant Launched at Delhi's at Narela"; "Narela Waste Plant Opened, to Generate 24 Mw Power", *The Times of India*, March 11, 2017, https://timesofindia.indiatimes.com/city/delhi/narela-waste-plant-opened-to-generate-24mw-power/articleshow/57583891.cms (last accessed April 9, 2019); Shivani Wadehra and Arabinda Mishra, "Delhi's Waste Woes: Is There a Way Out?", *Economic & Political Weekly*, December 29, 2017, http://www.epw.in/engage/article/delhi-waste-woes-is-there-a-way-out (last accessed April 11, 2019).

727 Rashme Sehgal, "As Delhi Prepares to Segregate Its Waste at Source, Lessons from Other Such Efforts", *The Wire*, June 27, 2017, https://thewire.in/urban/as-delhi-prepares-to-segregate-its-waste-at-source-many-lessons-to-be-learnt-from-other-cities (last accessed May 3, 2019); "Municipal Solid Waste Segregation at Source in Delhi to Be Launched", *The Times of India*, June 5, 2017, https://timesofindia.indiatimes.com/good-governance/centre/municipal-solid-waste-segregation-at-source-in-delhi-to-be-launched/articleshow/58995724.cms (last accessed May 3, 2019).

728 Ministry of Urban Development, "Shri M. Venkaiah Naidu Launches 'Segregation of Municipal Waste at Source Initiative for NCR", news release, 2017, http://pib.nic.in/newsite/PrintRelease.aspx?relid=164404.

729 Sehgal, "As Delhi Prepares to Segregate Its Waste at Source, Lessons from Other Such Efforts".

730 "SDMC Mobile Tranfer Stations Join Sanitation Fight to Segregate Waste", *The Indian Express*, June 5, 2017, https://indianexpress.com/article/cities/delhi/sdmc-mobile-transfer-stations-join-sanitation-fight-to-segregate-waste-4689202/ (last accessed April 9, 2019).

more than a decade and is yet still active, collapsed and two people died.[731] After the collapse, Delhi Chief Minister Arvind Kejriwal stated that "(…) "[f]resh garbage being generated should not become a mountain of garbage at landfill sites. No country in the world disposes off garbage this way (…) its and ancient way. (…) Most important thing there should be no fresh mountain of garbage"[732], while at the same time stating that "[t]wo landfill sites, one each in north and east Delhi, have been identified and fresh garbage will be dumped there"[733]. Further, Kejriwal mentioned that until September 2019, the existing garbage mountains should be processed and used for the construction of roads.[734] The focus remained on source segregation and a further inclusion of Delhi's RWA, with the MoHUA reaching out to over 10,000 RWAs in Delhi to ensure source segregation of MSW.[735] Towards the end of 2017, Delhi's Urban Development Department notified the State Policy and Solid Waste Management Strategy for Delhi, which was to be notified within one year of the notification of the SWM Rules, 2016. Delhi's MSWM scenario is described as following:

> Municipal waste management in Delhi is becoming a critical issue particularly due to huge increase in urban population and increasing affluence in the city resulting in generation of large volumes of waste. The existing collection and transportation of waste is not efficient enough, which has led to unauthorized dumping. The road sweeping is not comprehensive. There is a lack of capacity for waste storage at land fill sites and waste processing facilities are inadequate. The SDMC, North DMC and EDMC lack resources and technical expertise. The legal provisions in the DMC Act, and their enforcement mechanism are weak and there is lack of monitoring mechanism of human resources deployed for SWM. There is also lack of awareness about waste segregation, recycle, reuse, reduction and good solid waste management practices. In addition, the problem becomes difficult to solve in view of existence of unauthorised colonies, urban slums and multiplicity of area/land/street/road owning govt. agencies whose roles and responsibilities overlap and above all the negative public perception about SWM in Delhi.[736]

The strategy points out interventions and underlines the roles and responsibilities of Delhi's MSWM actors. The strategy puts a focus on elements such as the implementation of the waste hierarchy concept and the ISWM concept, the introduction of economic instruments, the strengthening of the capacities of the ULBs of Delhi and the regulatory framework, the promotion of private and municipal partnerships, the registration and identification of the

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731 Swati Singh Sambyal and Richa Agarwal, "Ghazipur Landfill Collapse Is a Result of Years of Inaction", *Down to Earth*, September 02, 2017, https://www.downtoearth.org.in/news/waste/ghazipur-landfill-collapse-is-a-result-of-years-of-inaction-58588 (last accessed May 27, 2019).
732 "Will Ensure Garbage Mountains-Free Delhi, Says Chief Minister".
733 Ibid.
734 Ibid.
735 "Centre to Talk to Rwas for Segregation of Waste", *The Times of India*, September 18, 2017, https://timesofindia.indiatimes.com/city/delhi/centre-to-talk-to-rwas-for-segregation-of-waste/articleshow/60724565.cms (last accessed April 9, 2019).
736 Urban Development Department of Delhi, "State Policy and Solid Waste Management Strategy for Delhi", (New Delhi: Government of India, 2017), 13–14.

waste workers as well as increased community participation. Soon after the notification, the Supreme Court stepped in and confronted the government of Delhi by stating, "There is a strong support for cleaning up of the landfills of Delhi and remove garbage that is lying at Bhalswa, Gazipur and Okhla. However, there does not seem to be strong desire of the authorities to take steps in this regard."[737]

The developments in Delhi's MSWM economy in 2018 are shaped by the notification of the Solid Waste Management by-laws of NCT of Delhi, which were framed by the SDMC and initially to be notified within one year of the notification of the SWM Rules, 2016. All five ULBs shall implement the by-laws in their area. The Delhi by-laws, which outline the standard operating procedure for solid waste management in accordance to the SWM Rules, 2016, prescribe ten different kinds of fines in relation to the violation of source segregation and littering. Moreover, the by-laws define monthly user charges for DTDC of MSW. While there is a focus on the role and responsibilities of the waste generators, the by-laws also define penalties for companies selling disposable products while at the same time not having a collect-back system in place and for industries that do not switch to RDF as fuel. In addition to this, the by-laws provide for the ULBs to ensure the collection and transportation of segregated waste, also through the involvement of informal waste workers.[738] The response to the by-laws was mixed. Some critics saw the potential of the by-laws to equip "Delhi's 'toothless tiger' municipalities"[739] with regulations to deal with waste generators and the possibility of a transformation of Delhi's MSWM economy.[740]

> The by-laws have remarkable provisions, which if implemented properly, should lead to transformational changes. (…) The by-laws provide legal teeth to the regulators. Municipal corporations must now ensure that the details of the by-laws are widely disseminated to educate the public about their role and responsibility. At the same time, corporations must create efficient systems to support end-to-end segregation, processing and

737 "Supreme Court Pulls up Delhi Government, Says Solid Waste Management a Problem", *The New Indian Express*, December 12, 2017, http://www.newindianexpress.com/cities/delhi/2017/dec/12/supreme-court-pulls-up-delhi-government-says-solid-waste-management-a-problem-1725381.html (last accessed May 2, 2019).

738 Urban Development Department of Delhi, "Solid Waste Management Bye-Laws", (New Delhi: Government of India, 2018).

739 Baishali Adak, "Delhi: Sweeping Changes in City Waste Management Laws", *India Today*, January 17, 2018, https://www.indiatoday.in/mail-today/story/delhi-sweeping-changes-in-city-waste-management-laws-1147375-2018-01-17 (last accessed April 9, 2019).

740 Swati Singh Sambyal, "Delhi's Solid Waste Management Bye-Laws Focus on Individual Accountability", *Down to Earth*, January 24, 2018, http://www.downtoearth.org.in/news/delhi-gets-it-new-byelaws-on-solid-waste-management-59559 (last accessed April 11, 2019); Swati Singh Sambyal, "By-Laws for Solid Waste Management in Delhi Were Finally Notified. What Next?", *Down to Earth*, February 16, 2018, https://www.downtoearth.org.in/blog/waste/broom-sticks-59713 (last accessed April 11, 2019); Adak, "Delhi: Sweeping Changes in City Waste Management Laws"; Swati Singh Sambyal, "Local Authorities in Delhi Can Use Imaginative by-Laws to Clean up the City", *Down to Earth,* 2018, https://www.downtoearth.org.in/blog/waste/local-authorities-in-delhi-can-use-imaginative-by-laws-to-clean-up-the-city-58546 (last accessed May 2, 2019).

> appropriate disposal of solid waste. Only then can we change the filthy environs of Delhi. Otherwise, it would just be another case of a good policy wasted due to inaction.[741]

Other environmental activists and NGO representatives perceive the by-laws differently:

> The bye laws are so bad. I don't like a single word of this. What is responsibility of the SDMC? It sounds as if it is all on the waste generator. (…) And when we talk about waste pickers, the fight should not be about ID cards or collection but about the need for clean *maal* in order to protect the waste pickers workplace. (…) If you only fight for an ID card, you only have an ID card, but still no clean *maal*.[742]

The outlook on the years after the notification of India's revised SWM Rules, 2016 ends in mid-2018 when the Supreme Court allowed for the cutting of trees in Delhi's Ridge area.[743] The Supreme Court approved the setting up of a landfill and of a WTE plant in this part of Delhi. It is these Supreme Court proceedings that state that "Waste to Energy is the most eco friendly method of disposal of MSW"[744]. The Supreme Court's approval as well as this statement raised multiple concerns:

> Setting up a WTE plant and a landfill in an ecologically fragile area has its own challenges. The emissions from the landfill will add to the already choked city air. (…) The proposed plant and landfill in Delhi Ridge will also disturb the ecologically fragile area spread over 6,200 hectares (ha), home to several indigenous species. With Delhi facing significant pressure on its green spaces and air pollution being a potent problem, cutting into the forest for more land is, hence, not advisable.[745]

In August 2018, the Supreme Court asked the Lieutenant Governor (LG) to constitute a committee to deal with Delhi's solid waste management issue, which the Supreme Court described as a "very serious problem"[746], and the North Delhi Municipal Cooperation started the construction of Delhi's fourth WtE plant at Bhalswa[747].

Considering the developments and events of the past and also the recent years surrounding Delhi's MSWM economy, it appears as if the city is on the one hand in a constant motion when it comes to involved stakeholders as well as new approaches and profound decisions.

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741 Singh Sambyal, "By-Laws for Solid Waste Management in Delhi Were Finally Notified. What Next?".
742 NGO representative, New Delhi, February 2017.
743 Delhi's Ridge area is a 7,777 hectare large forest area, which has been notified as Reserved Forests under the Indian Forest Act, 1927 and is considered to be Delhi's 'green lung'. Delhi Forest Department, "Forests of Delhi", http://forest.delhigovt.nic.in/wps/wcm/connect/doit_forest/Forest/Home/Forests+of+Delhi/Recorded+Forest (last accessed May 26, 2019).
744 Supreme Court of India, *Record of Proceedings. Writ Petition(S) (Civil) No(S). 202/1995*.
745 Agarwal, "Why a Landfill and Waste-to-Energy Plant in Delhi Ridge Is a Bad Idea".
746 "Supreme Court Says Solid Waste in Delhi a Serious Problem, Asks Lg to Constitute Committee", *The New Indian Express*, August 17, 2018, http://www.newindianexpress.com/cities/delhi/2018/aug/17/supreme-court-says-solid-waste-in-delhi-a-serious-problem-asks-lg-to-constitute-committee-1859041.html (last accessed May 2, 2019).
747 Sharma, "North Delhi Municipal Corporation to Start Work on Waste-to-Energy Plant at Bhalswa by August End".

On the other hand, one gets a notion of standstill and paralysis in the face of the ever-growing waste quantities, non-ideal treatment options, the lack of enforcement, the continuous use of landfills and the level of responsibilities as well as ownership of involved actors. Delhi as the capital is a mirror to the identified insights as well as limitations mentioned in Chapter 6.1. This becomes especially evident when observing the public debates among public and private stakeholders as well as community-level representatives: the discussions continue to evolve around questions related to Delhi's regulatory MSWM framework, the role and responsibilities of Delhi's public and private formal actors and waste workers, the pros and cons of the treatment technologies that are used in Delhi as well as the role of Delhi's waste generators on a community level. While Delhi's waste workers have always considered the city's MSW as a resource rather than waste, the public sector is following up: the waste-related public debate increasingly revolves around terms such as 'circular economy', 'resource efficiency', 'value of waste', 'sustainable lifestyles', 'inclusivity' and the 'reinvention of waste management', which emphasises a notion of a shift in understanding waste not only as a burden but also as a resource.

"It will not be easy for large societies to change their style of living. They cannot be coerced to do so, nor can governmental action suffice. People can be motivated and urged to participate in better alternatives."[748] In today's India with its rising population, increasing urbanisation levels, growing middle class, changing consumption patterns and the continually increasing generation of waste, Indira Gandhi's remarks which were made almost fifty years ago are more fitting than ever. The participation in better alternatives first and foremost requires alternatives. As outlined earlier, while circular economy approaches start to get mainstreamed into India's MSWM policy setting and system, innovative consumption, such as consuming services rather than products or sharing products and infrastructure, is on the rise and supports the development of a circular economy. Other processes such as urban mining with the recovery of resources from landfills or unused urban spaces at its core become increasingly relevant.[749] "Urban mining is increasingly being recognised as an important component of resource strategies of public authorities, not only because it contributes to environmental protection, but also because it is a source of valuable recyclable materials."[750]

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[748] Indira Gandhi, "Man and Environment", in *United National Conference on Human Environment* (Stockholm 1972).
[749] Chaturvedi, Vijayalakshmi, and Nijhawan, *Scenarios of Waste and Resource Management: For Cities in India and Elsewhere*, 10.
[750] Arora, Paterok, Banerjee et al., "Potential and Relevance of Urban Mining in the Context of Sustainable Cities", 5.

In India's current MSWM scenario, it is the urgency that calls for conceptual and governance changes, which will hopefully pave the way for innovative, sustainable and resilient MSWM processes and systems.

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Appendices

Appendix-I: Inventory of Relevant Municipal Solid Waste Government Policy Documents

No	Issuer	Name	Year
1	Ministry of Environment and Forests (MoEF)	The Environment (Protection) Act, 1986	1986
2	Ministry of Environment and Forests (MoEF)	Policy Statement for Abatement of Pollution	1992
3	Planning Commission	Report of the High Power Committee, Urban Solid Waste management in India	1995
4	Ministry of Environment and Forests (MoEF)	Guidelines for Recycling of Plastics (1998)	1998
5	Supreme Court of India	Solid Waste Management in Class 1 Cities in India, Report of the Committee constituted by the Hon. Supreme Court of India	1999
6	Ministry of Environment and Forests (MoEF)	Recycled Plastics Manufacture and Usage Rules, 1999	1999
7	Ministry of Environment and Forests (MoEF)	The Municipal Solid Wastes (Management and Handling) Rules, 2000	2000
8	Central Public Health & Environmental Engineering Organisation (CPHEEO), Ministry of Urban Development (MoUD)	Manual on municipal solid waste management	2000

9	Ministry of Environment and Forests (MoEF)	Agenda 21–An Assessment	2002
10	Ministry of Environment and Forests (MoEF)	India's Initial National Communication to the United Nations Framework Convention on Climate Change, 2004	2004
11	Central Public Health & Environmental Engineering Organisation (CPHEEO), Ministry of Urban Development (MoUD)	Report of the Technology Advisory Group on Solid Waste Management	2005
12	Ministry of Urban Development (MoUD)	Jawaharlal Nehru National Urban Renewal Mission	2005
13	National Institute of Urban Affairs (NIUA), Central Public Health & Environmental Engineering Organisation (CPHEEO), Ministry of Urban Development (MoUD)	Status of Water Supply, Sanitation and Solid Waste Management	2005
14	Ministry of Environment and Forests (MoEF)	National Environment Policy 2006	2006
15	Comptroller and Auditor General of India (CAG)	The CAG Audit Report on Municipal Solid Waste in India	2008
16	Prime Minister's Council on Climate Change	National Action Plan for Climate Change	2008
17	Ministry of Urban Development (MoUD)	Standing Committee on Urban Development. Solid Waste Management	2009
18	Ministry of Finance (MoF)	Position Paper on the Solid Waste Management Sector in India	2009
19	Central Pollution Control Board (CPCB), Ministry of Environment and Forests (MoEF)	Solid Waste Management Parliamentary Standing Committee (Fifth report)	2010
20	Ministry of Urban Development (MoUD)	Report of the Committee to frame National Sustainable Habitat Standards for the Municipal Solid Waste Management	2010

21	Ministry of Environment and Forests (MoEF)	Report of the Committee to Evolve Road Map on Management of Waste in India	2010
22	Ministry of Urban Development (MoUD)	Standing Committee on Urban Development. Solid Waste Management	2010
23	Ministry of Urban Development (MoUD), Centre for Excellence in Urban Development in the area Solid Waste and Waste Water Management	Strategy and Framework for Municipal Solid Waste Management	2011
24	Ministry of Environment and Forests (MoEF)	Plastic Waste (Management and Handling) Rules, 2011	2011
25	Ministry of Urban Development (MoUD)	Toolkit for Solid Waste Management, JNNURM	2012
26	Ministry of Urban Development (MoUD)	Advisory on Improving Municipal Solid Waste Management Services	2013
27	Ministry of Environment and Forests (MoEF)	Draft Solid Waste Management Rules	2013
28	Planning Commission	Report of the Taskforce on Waste to Energy (Volume I)	2014
29	Ministry of Environment, Forest and Climate Change (MoEFCC)	India's Progress in Combating Climate Change (GoI)	2014
30	Ministry of Urban Development (MoUD)	Swachh Bharat Abhiyan – Urban (SBM-U), 2014 Ministry of Housing and Urban Affairs	2014
31	Ministry of Environment, Forest and Climate Change (MoEFCC)	Plastic Waste Management Rules 2015	2015
32	Central Pollution Control Board (CPCB), Ministry of Environment, Forest and Climate Change (MoEFCC)	Consolidated Annual Review Report on Implementation of Municipal Solid Waste (Management and Handling) Rules	2015
33	Ministry of Urban Development (MoUD)	Smart Cities Mission: Statement and Guideline	2015

34	Ministry of Environment, Forest and Climate Change (MoEFCC)	India's Intended Nationally Determined Contribution (GoI)	2015
35	Central Public Health & Environmental Engineering Organisation (CPHEEO), Ministry of Urban Development (MoUD)	Swachh Bharat Mission Municipal Solid Waste Management Manual	2016
36	Ministry of Environment, Forest and Climate Change (MoEFCC)	Solid Waste Management Rules, 2016	2016
37	Central Public Health & Environmental Engineering Organisation (CPHEEO), Ministry of Urban Development (MoUD)	Swachh Bharat Mission - Municipal Solid Waste Management Manual	2016

Appendix-II: Inventory of Attended Conferences and Workshops

No	Workshop/Conference	Date and place	Organised by
1	Urban Age Conference	November 14–15, 2014, New Delhi	The London School of Economics and Political Science (LSE), Alfred Herrhausen Gesellschaft
2	Green and Inclusive Economy – a contribution to the 2030 Agenda of Sustainable Development: Exploring pathways towards a green and inclusive transformation	October 28, 2015, New Delhi	Indo-German Expert Group on Green and Inclusive Economy
3	Green and Inclusive Economy – a contribution to the 2030 Agenda of Sustainable Development: Sustainable lifestyles & Decoupling economic growth from resource consumption	October 29, 2015, New Delhi	Indo-German Expert Group on Green and Inclusive Economy
4	Securing Sustainable Resource Utilization and Reuse of Secondary Raw Materials by Fostering Resource Efficiency	November 17, 2015, New Delhi	Gesellschaft für Internationale Zusammenarbeit (GIZ), Ministry of Environment, Forest and Climate Change (MoEFCC)
5	Extended Producer Responsibility (EPR) for end-of-life vehicles, e-waste and packaging	May 12–13, 2016, New Delhi	GIZ, OECD, MoEFCC, Central Pollution Control Board (CPCB)

6	4th National Conference on "Waste to Wealth: Solid Waste, Industrial Waste, E-Waste	June 30, 2016, New Delhi	The Associated Chambers of Commerce and Industry of India (ASSOCHAM)
7	A Circular Economy Vision for India – Expert Input Workshop	August 2, 2016, New Delhi	Ellen MacArthur Foundation
8	Indo-German Conference Cityscapes	September 29, 2016, New Delhi	The German House for Research and Innovation
9	Indo-German Conference Cityscapes: Impact of urbanisation on Environment & Smart Cities: Industry Perspective	September 30, 2016, New Delhi	The German House for Research and Innovation
10	National Workshop on Utilization of C&D Waste in Construction	September 23, 2016, New Delhi	Building Materials & Technology Promotion Council (BMTPC)
11	Workshop on Solid Waste Management: Reinvention, Opportunities and Way Ahead&Book launch of Not In My Backyard	July 12, 2016, New Delhi	Centre for Science and Environment (CSE)
12	TERI's World Sustainable Development Summit: Resource Efficiency and the Circular Economy	October 06, 2016, New Delhi	The Energy and Resources Institute (TERI)
13	Indian Conference on Life Cycle Management	October 18–19, 2016, New Delhi	Federation of Indian Chambers of Commerce & Industry (FICCI)
14	Resource Security: Contextualizing Domestic Interests in the Global Trade and Investment Framework	October 24, 2016, New Delhi	TERI, Konrad-Adenauer-Stiftung (KAS)
15	Workshop on Extended Producer Responsibility MSW	November 24, 2016, New Delhi	GIZ
16	Industry Consultation on Indian Resource Panel Policy Mapping on Resource Efficiency	December 08, 2016, New Delhi	Confederation of Indian Industry (CII), GIZ
17	GIZ and CII Joint Industry Consultation Workshop on Transition to a Resource Efficient Economy in India	February 28, 2017, New Delhi	CII, GIZ
18	5th National Conference and Awards on Waste to Wealth	March 30, 2017, New Delhi	The Associated Chambers of Commerce and Industry of India (ASSOCHAM)
19	Circular Economy Symposium	April 25, 2017, New Delhi	FICCI
20	International Conference on Resource Efficiency	November 02, 2017, New Delhi	CII–Green Business Centre (GBC)

21	Valuing Waste or Wasting value	February 12, 2018, New Delhi	Centre for Policy Research (CPR), Alliance Française de Delhi (AF)
22	The City of Waste	February 13, 2018, New Delhi	Centre for Social Sciences and Humanities (CSH)
23	TERI's World Sustainable Development Summit: Towards Resource-Efficient Management of Plastic Waste	February 15, 2018, New Delhi	TERI, European Union (EU)
24	Informal discussion on waste and air pollution	February 22, 2018, New Delhi	Chintan
25	Inclusion of Waste-Pickers in Solid Waste Management of Delhi. Strategy Making for the Inclusion of Waste-Pickers in the implementation of rules and bye-laws	March 21, 2018, New Delhi	The Alliance of Indian Wastepickers (AIW), All India Kabadi Majdoor Mahasangh (AIKMM)
26	World Environment Day, 2018: Sustainable Lifestyles towards enhancing Resource Efficiency and Circular Economy	June 02, 2018, New Delhi	GIZ, Development Alternatives Group (DA), TERI
27	World Environment Day, 2018: Extended Producer Responsibility	June 03, 2018, New Delhi	GIZ
28	13th Sustainability Summit	September 06, 2018, New Delhi	CII–ITC
29	Workshop - The Future of Solid Waste and Wastewater Management in India	September 28, 2018, New Delhi	Swachh Bharat Mission, EU